OM-1326 205 654T
July 2005

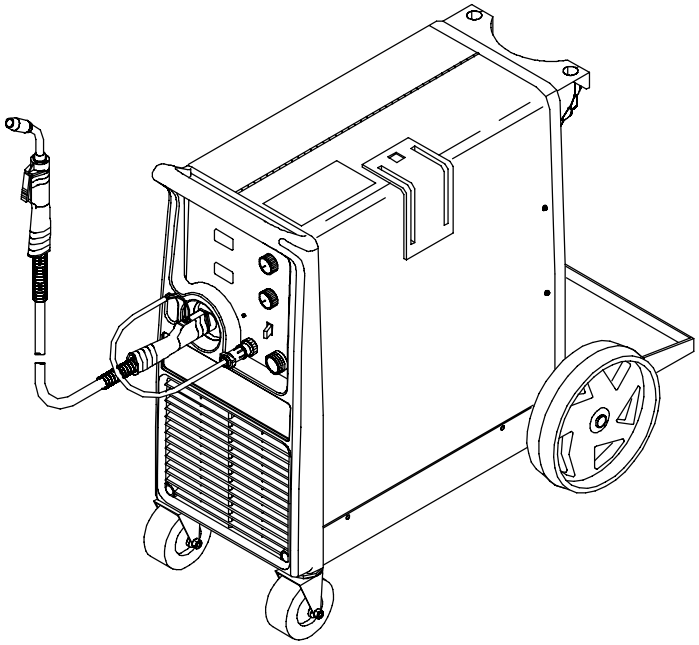
Processes

MIG (GMAW) Welding
Flux Cored (FCAW) Welding

Description

Arc Welding Power Source
and Wire Feeder

Millermatic® 251 And M-25 Gun



OWNER'S MANUAL

MANUAL DEL OPERADOR

(cuando disponible) sigue al manual en inglés

Visit our website at
www.MillerWelds.com

File: MIG (GMAW)

From Miller to You

Thank you and *congratulations* on choosing Miller. Now you can get the job done and get it done right. We know you don't have time to do it any other way.

That's why when Niels Miller first started building arc welders in 1929, he made sure his products offered long-lasting value and superior quality. Like you, his customers couldn't afford anything less. Miller products had to be more than the best they could be. They had to be the best you could buy.

Today, the people that build and sell Miller products continue the tradition. They're just as committed to providing equipment and service that meets the high standards of quality and value established in 1929.

This Owner's Manual is designed to help you get the most out of your Miller products. Please take time to read the Safety precautions. They will help you protect yourself against potential hazards on the worksite.

ISO 9001:2000 REGISTERED QUALITY SYSTEM

Miller is the first welding equipment manufacturer in the U.S.A. to be registered to the ISO 9001:2000 Quality System Standard.

We've made installation and operation quick and easy. With Miller you can count on years of reliable service with proper maintenance. And if for some reason the unit needs repair, there's a Troubleshooting section that will help you figure out what the problem is. The parts list will then help you to decide the exact part you may need to fix the problem. Warranty and service information for your particular model are also provided.

Miller Electric manufactures a full line of welders and welding related equipment. For information on other quality Miller products, contact your local Miller distributor to receive the latest full line catalog or individual specification sheets. **To locate your nearest distributor or service agency call 1-800-4-A-Miller, or visit us at www.MillerWelds.com on the web.**

TRUE BLUE® WARRANTY

Working as hard as you do – every power source from Miller is backed by the most hassle-free warranty in the business.

Miller®

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SECTION 1 – SAFETY PRECAUTIONS - READ BEFORE USING

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▲ **Warning: Protect yourself and others from injury — read and follow these precautions.**

1-1. Symbol Usage

Means Warning! Watch Out! There are possible hazards with this procedure! The possible hazards are shown in the adjoining symbols.

▲ **Marks a special safety message.**

☞ *Means "Note"; not safety related.*

This group of symbols means Warning! Watch Out! possible ELECTRIC SHOCK, MOVING PARTS, and HOT PARTS hazards. Consult symbols and related instructions below for necessary actions to avoid the hazards.

1-2. Arc Welding Hazards

▲ **The symbols shown below are used throughout this manual to call attention to and identify possible hazards. When you see the symbol, watch out, and follow the related instructions to avoid the hazard. The safety information given below is only a summary of the more complete safety information found in the Safety Standards listed in Section 1-5. Read and follow all Safety Standards.**

▲ **Only qualified persons should install, operate, maintain, and repair this unit.**

▲ **During operation, keep everybody, especially children, away.**

ELECTRIC SHOCK can kill.

Touching live electrical parts can cause fatal shocks or severe burns. The electrode and work circuit is electrically live whenever the output is on. The input power circuit and machine internal circuits are also live when power is on. In semiautomatic or automatic wire welding, the wire, wire reel, drive roll housing, and all metal parts touching the welding wire are electrically live. Incorrectly installed or improperly grounded equipment is a hazard.

- Do not touch live electrical parts.
- Wear dry, hole-free insulating gloves and body protection.
- Insulate yourself from work and ground using dry insulating mats or covers big enough to prevent any physical contact with the work or ground.
- Do not use AC output in damp areas, if movement is confined, or if there is a danger of falling.
- Use AC output ONLY if required for the welding process.
- If AC output is required, use remote output control if present on unit.
- Additional safety precautions are required when any of the following electrically hazardous conditions are present: in damp locations or while wearing wet clothing; on metal structures such as floors, gratings, or scaffolds; when in cramped positions such as sitting, kneeling, or lying; or when there is a high risk of unavoidable or accidental contact with the workpiece or ground. For these conditions, use the following equipment in order presented: 1) a semiautomatic DC constant voltage (wire) welder, 2) a DC manual (stick) welder, or 3) an AC welder with reduced open-circuit voltage. In most situations, use of a DC, constant voltage wire welder is recommended. And, do not work alone!
- Disconnect input power or stop engine before installing or servicing this equipment. Lockout/tagout input power according to OSHA 29 CFR 1910.147 (see Safety Standards).
- Properly install and ground this equipment according to its Owner's Manual and national, state, and local codes.
- Always verify the supply ground – check and be sure that input power cord ground wire is properly connected to ground terminal in disconnect box or that cord plug is connected to a properly grounded receptacle outlet.
- When making input connections, attach proper grounding conductor first – double-check connections.
- Frequently inspect input power cord for damage or bare wiring – replace cord immediately if damaged – bare wiring can kill.
- Turn off all equipment when not in use.
- Do not use worn, damaged, undersized, or poorly spliced cables.
- Do not drape cables over your body.
- If earth grounding of the workpiece is required, ground it directly with a separate cable.
- Do not touch electrode if you are in contact with the work, ground, or another electrode from a different machine.
- Do not touch electrode holders connected to two welding machines at the same time since double open-circuit voltage will be present.
- Use only well-maintained equipment. Repair or replace damaged parts at once. Maintain unit according to manual.
- Wear a safety harness if working above floor level.
- Keep all panels and covers securely in place.
- Clamp work cable with good metal-to-metal contact to workpiece or worktable as near the weld as practical.
- Insulate work clamp when not connected to workpiece to prevent contact with any metal object.
- Do not connect more than one electrode or work cable to any single weld output terminal.

SIGNIFICANT DC VOLTAGE exists in inverter-type welding power sources after removal of input power.

- Turn Off inverter, disconnect input power, and discharge input capacitors according to instructions in Maintenance Section before touching any parts.

FUMES AND GASES can be hazardous.

Welding produces fumes and gases. Breathing these fumes and gases can be hazardous to your health.

- Keep your head out of the fumes. Do not breathe the fumes.
- If inside, ventilate the area and/or use local forced ventilation at the arc to remove welding fumes and gases.
- If ventilation is poor, wear an approved air-supplied respirator.
- Read and understand the Material Safety Data Sheets (MSDSs) and the manufacturer's instructions for metals, consumables, coatings, cleaners, and degreasers.
- Work in a confined space only if it is well ventilated, or while wearing an air-supplied respirator. Always have a trained watchperson nearby. Welding fumes and gases can displace air and lower the oxygen level causing injury or death. Be sure the breathing air is safe.
- Do not weld in locations near degreasing, cleaning, or spraying operations. The heat and rays of the arc can react with vapors to form highly toxic and irritating gases.
- Do not weld on coated metals, such as galvanized, lead, or cadmium plated steel, unless the coating is removed from the weld area, the area is well ventilated, and while wearing an air-supplied respirator. The coatings and any metals containing these elements can give off toxic fumes if welded.

ARC RAYS can burn eyes and skin.

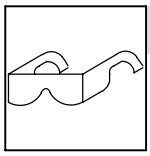
Arc rays from the welding process produce intense visible and invisible (ultraviolet and infrared) rays that can burn eyes and skin. Sparks fly off from the weld.

- Wear an approved welding helmet fitted with a proper shade of filter lenses to protect your face and eyes when welding or watching (see ANSI Z49.1 and Z87.1 listed in Safety Standards).
- Wear approved safety glasses with side shields under your helmet.
- Use protective screens or barriers to protect others from flash, glare and sparks; warn others not to watch the arc.
- Wear protective clothing made from durable, flame-resistant material (leather, heavy cotton, or wool) and foot protection.

WELDING can cause fire or explosion.

Welding on closed containers, such as tanks, drums, or pipes, can cause them to blow up. Sparks can fly off from the welding arc. The flying sparks, hot workpiece, and hot equipment can cause fires and burns. Accidental contact of electrode to metal objects can cause sparks, explosion, overheating, or fire. Check and be sure the area is safe before doing any welding.

- Remove all flammables within 35 ft (10.7 m) of the welding arc. If this is not possible, tightly cover them with approved covers.
- Do not weld where flying sparks can strike flammable material.
- Protect yourself and others from flying sparks and hot metal.
- Be alert that welding sparks and hot materials from welding can easily go through small cracks and openings to adjacent areas.
- Watch for fire, and keep a fire extinguisher nearby.
- Be aware that welding on a ceiling, floor, bulkhead, or partition can cause fire on the hidden side.
- Do not weld on closed containers such as tanks, drums, or pipes, unless they are properly prepared according to AWS F4.1 (see Safety Standards).
- Connect work cable to the work as close to the welding area as practical to prevent welding current from traveling long, possibly unknown paths and causing electric shock, sparks, and fire hazards.
- Do not use welder to thaw frozen pipes.
- Remove stick electrode from holder or cut off welding wire at contact tip when not in use.
- Wear oil-free protective garments such as leather gloves, heavy shirt, cuffless trousers, high shoes, and a cap.
- Remove any combustibles, such as a butane lighter or matches, from your person before doing any welding.
- Follow requirements in OSHA 1910.252 (a) (2) (iv) and NFPA 51B for hot work and have a fire watcher and extinguisher nearby.



FLYING METAL can injure eyes.

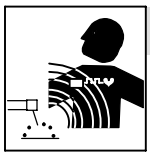
- Welding, chipping, wire brushing, and grinding cause sparks and flying metal. As welds cool, they can throw off slag.
- Wear approved safety glasses with side shields even under your welding helmet.

BUILDUP OF GAS can injure or kill.

- Shut off shielding gas supply when not in use.
- Always ventilate confined spaces or use approved air-supplied respirator.

HOT PARTS can cause severe burns.

- Do not touch hot parts bare handed.
- Allow cooling period before working on gun or torch.
- To handle hot parts, use proper tools and/or wear heavy, insulated welding gloves and clothing to prevent burns.



MAGNETIC FIELDS can affect pacemakers.

- Pacemaker wearers keep away.
- Wearers should consult their doctor before going near arc welding, gouging, or spot welding operations.

NOISE can damage hearing.

Noise from some processes or equipment can damage hearing.

- Wear approved ear protection if noise level is high.

CYLINDERS can explode if damaged.

Shielding gas cylinders contain gas under high pressure. If damaged, a cylinder can explode. Since gas cylinders are normally part of the welding process, be sure to treat them carefully.

- Protect compressed gas cylinders from excessive heat, mechanical shocks, physical damage, slag, open flames, sparks, and arcs.
- Install cylinders in an upright position by securing to a stationary support or cylinder rack to prevent falling or tipping.
- Keep cylinders away from any welding or other electrical circuits.
- Never drape a welding torch over a gas cylinder.
- Never allow a welding electrode to touch any cylinder.
- Never weld on a pressurized cylinder – explosion will result.
- Use only correct shielding gas cylinders, regulators, hoses, and fittings designed for the specific application; maintain them and associated parts in good condition.
- Turn face away from valve outlet when opening cylinder valve.
- Keep protective cap in place over valve except when cylinder is in use or connected for use.
- Use the right equipment, correct procedures, and sufficient number of persons to lift and move cylinders.
- Read and follow instructions on compressed gas cylinders, associated equipment, and Compressed Gas Association (CGA) publication P-1 listed in Safety Standards.

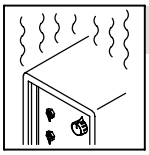
1-3. Additional Symbols For Installation, Operation, And Maintenance

FIRE OR EXPLOSION hazard.

- Do not install or place unit on, over, or near combustible surfaces.
- Do not install unit near flammables.
- Do not overload building wiring – be sure power supply system is properly sized, rated, and protected to handle this unit.

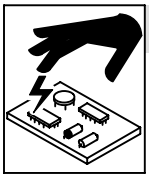
FALLING UNIT can cause injury.

- Use lifting eye to lift unit only, NOT running gear, gas cylinders, or any other accessories.
- Use equipment of adequate capacity to lift and support unit.
- If using lift forks to move unit, be sure forks are long enough to extend beyond opposite side of unit.



OVERUSE can cause OVERHEATING

- Allow cooling period; follow rated duty cycle.
- Reduce current or reduce duty cycle before starting to weld again.
- Do not block or filter airflow to unit.



STATIC (ESD) can damage PC boards.

- Put on grounded wrist strap BEFORE handling boards or parts.
- Use proper static-proof bags and boxes to store, move, or ship PC boards.

MOVING PARTS can cause injury.

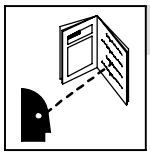
- Keep away from moving parts.
- Keep away from pinch points such as drive rolls.

WELDING WIRE can cause injury.

- Do not press gun trigger until instructed to do so.
- Do not point gun toward any part of the body, other people, or any metal when threading welding wire.

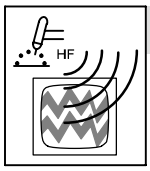
MOVING PARTS can cause injury.

- Keep away from moving parts such as fans.
- Keep all doors, panels, covers, and guards closed and securely in place.
- Have only qualified persons remove doors, panels, covers, or guards for maintenance as necessary.
- Reinstall doors, panels, covers, or guards when maintenance is finished and before re-connecting input power.



READ INSTRUCTIONS.

- Read Owner's Manual before using or servicing unit.
- Use only genuine Miller/Hobart replacement parts.



H.F. RADIATION can cause interference.

- High-frequency (H.F.) can interfere with radio navigation, safety services, computers, and communications equipment.
- Have only qualified persons familiar with electronic equipment perform this installation.
- The user is responsible for having a qualified electrician promptly correct any interference problem resulting from the installation.
- If notified by the FCC about interference, stop using the equipment at once.
- Have the installation regularly checked and maintained.
- Keep high-frequency source doors and panels tightly shut, keep spark gaps at correct setting, and use grounding and shielding to minimize the possibility of interference.

ARC WELDING can cause interference.

- Electromagnetic energy can interfere with sensitive electronic equipment such as computers and computer-driven equipment such as robots.
- Be sure all equipment in the welding area is electromagnetically compatible.
- To reduce possible interference, keep weld cables as short as possible, close together, and down low, such as on the floor.
- Locate welding operation 100 meters from any sensitive electronic equipment.
- Be sure this welding machine is installed and grounded according to this manual.
- If interference still occurs, the user must take extra measures such as moving the welding machine, using shielded cables, using line filters, or shielding the work area.

1-4. California Proposition 65 Warnings

▲ **Welding or cutting equipment produces fumes or gases which contain chemicals known to the State of California to cause birth defects and, in some cases, cancer. (California Health & Safety Code Section 25249.5 et seq.)**

▲ **Battery posts, terminals and related accessories contain lead and lead compounds, chemicals known to the State of California to cause cancer and birth defects or other reproductive harm. Wash hands after handling.**

For Gasoline Engines:

▲ **Engine exhaust contains chemicals known to the State of California to cause cancer, birth defects, or other reproductive harm.**

For Diesel Engines:

▲ **Diesel engine exhaust and some of its constituents are known to the State of California to cause cancer, birth defects, and other reproductive harm.**

1-5. Principal Safety Standards

Safety in Welding, Cutting, and Allied Processes, ANSI Standard Z49.1, from Global Engineering Documents (phone: 1-877-413-5184, website: www.global.ihs.com).

Recommended Safe Practices for the Preparation for Welding and Cutting of Containers and Piping, American Welding Society Standard AWS F4.1 from Global Engineering Documents (phone: 1-877-413-5184, website: www.global.ihs.com).

National Electrical Code, NFPA Standard 70, from National Fire Protection Association, P.O. Box 9101, 1 Battery March Park, Quincy, MA 02269–9101 (phone: 617–770–3000, website: www.nfpa.org).

Safe Handling of Compressed Gases in Cylinders, CGA Pamphlet P-1, from Compressed Gas Association, 1735 Jefferson Davis Highway, Suite 1004, Arlington, VA 22202–4102 (phone: 703–412–0900, website: www.cganet.com).

Code for Safety in Welding and Cutting, CSA Standard W117.2, from Canadian Standards Association, Standards Sales, 178 Rexdale Boulevard, Rexdale, Ontario, Canada M9W 1R3 (phone: 800–463–6727 or in Toronto 416–747–4044, website: www.csa–international.org).

Practice For Occupational And Educational Eye And Face Protection, ANSI Standard Z87.1, from American National Standards Institute, 11 West 42nd Street, New York, NY 10036–8002 (phone: 212–642–4900, website: www.ansi.org).

Standard for Fire Prevention During Welding, Cutting, and Other Hot Work, NFPA Standard 51B, from National Fire Protection Association, P.O. Box 9101, 1 Battery March Park, Quincy, MA 02269–9101 (phone: 617–770–3000, website: www.nfpa.org).

OSHA, Occupational Safety and Health Standards for General Industry, Title 29, Code of Federal Regulations (CFR), Part 1910, Subpart Q, and Part 1926, Subpart J, from U.S. Government Printing Office, Superintendent of Documents, P.O. Box 371954, Pittsburgh, PA 15250 (there are 10 Regional Offices––phone for Region 5, Chicago, is 312–353–2220, website: www.osha.gov).

1-6. EMF Information

Considerations About Welding And The Effects Of Low Frequency Electric And Magnetic Fields

Welding current, as it flows through welding cables, will cause electromagnetic fields. There has been and still is some concern about such fields. However, after examining more than 500 studies spanning 17 years of research, a special blue ribbon committee of the National Research Council concluded that: "The body of evidence, in the committee's judgment, has not demonstrated that exposure to power-frequency electric and magnetic fields is a human-health hazard." However, studies are still going forth and evidence continues to be examined. Until the final conclusions of the research are reached, you may wish to minimize your exposure to electromagnetic fields when welding or cutting.

To reduce magnetic fields in the workplace, use the following procedures:

1. Keep cables close together by twisting or taping them.
2. Arrange cables to one side and away from the operator.
3. Do not coil or drape cables around your body.
4. Keep welding power source and cables as far away from operator as practical.
5. Connect work clamp to workpiece as close to the weld as possible.

About Pacemakers:

Pacemaker wearers consult your doctor before welding or going near welding operations. If cleared by your doctor, then following the above procedures is recommended.

SECTION 2 – CONSIGNES DE SÉCURITÉ – LIRE AVANT UTILISATION

▲ **Avertissement : se protéger et protéger les autres contre le risque de blessure — lire et respecter ces consignes.**

2-1. Symboles utilisés

Symbole graphique d'avertissement ! Attention ! Cette procédure comporte des risques possibles ! Les dangers éventuels sont représentés par les symboles graphiques joints.

▲ **Indique un message de sécurité particulier**

☞ *Signifie NOTE ; n'est pas relatif à la sécurité.*

Ce groupe de symboles signifie Avertissement ! Attention ! Risques d'ÉLECTROCUTION, ORGANES MOBILES et PARTIES CHAUDES. Consulter les symboles et les instructions afférentes ci-dessous concernant les mesures à prendre pour supprimer les dangers.

2-2. Dangers relatifs au soudage à l'arc

▲ **Les symboles représentés ci-dessous sont utilisés dans ce manuel pour attirer l'attention et identifier les dangers possibles. En présence de l'un de ces symboles, prendre garde et suivre les instructions afférentes pour éviter tout risque. Les instructions en matière de sécurité indiquées ci-dessous ne constituent qu'un sommaire des instructions de sécurité plus complètes fournies dans les normes de sécurité énumérées dans la Section 2-5. Lire et observer toutes les normes de sécurité.**

▲ **Seul un personnel qualifié est autorisé à installer, faire fonctionner, entretenir et réparer cet appareil.**

▲ **Pendant le fonctionnement, maintenir à distance toutes les personnes, notamment les enfants de l'appareil.**

UNE DÉCHARGE ÉLECTRIQUE peut entraîner la mort.

Le contact d'organes électriques sous tension peut provoquer des accidents mortels ou des brûlures graves. Le circuit de l'électrode et de la pièce est sous tension lorsque le courant est délivré à la sortie. Le circuit d'alimentation et les circuits internes de la machine sont également sous tension lorsque l'alimentation est sur Marche. Dans le mode de soudage avec du fil, le fil, le dérouleur, le bloc de commande du rouleau et toutes les parties métalliques en contact avec le fil sont sous tension électrique. Un équipement installé ou mis à la terre de manière incorrecte ou impropre constitue un danger.

- Ne pas toucher aux pièces électriques sous tension.
- Porter des gants isolants et des vêtements de protection secs et sans trous.
- S'isoler de la pièce à couper et du sol en utilisant des housses ou des tapis assez grands afin d'éviter tout contact physique avec la pièce à couper ou le sol.
- Ne pas se servir de source électrique à courant électrique dans les zones humides, dans les endroits confinés ou là où on risque de tomber.
- Se servir d'une source électrique à courant électrique UNIQUEMENT si le procédé de soudage le demande.
- Si l'utilisation d'une source électrique à courant électrique s'avère nécessaire, se servir de la fonction de télécommande si l'appareil en est équipé.
- D'autres consignes de sécurité sont nécessaires dans les conditions suivantes : risques électriques dans un environnement humide ou si l'on porte des vêtements mouillés ; sur des structures métalliques telles que sols, grilles ou échafaudages ; en position coincée comme assise, à genoux ou couchée ; ou s'il y a un risque élevé de contact inévitable ou accidentel avec la pièce à souder ou le sol. Dans ces conditions, utiliser les équipements suivants, dans l'ordre indiqué : 1) un poste à souder DC à tension constante (à fil), 2) un poste à souder DC manuel (électrode) ou 3) un poste à souder AC à tension à vide réduite. Dans la plupart des situations, l'utilisation d'un poste à souder DC à fil à tension constante est recommandée. En outre, ne pas travailler seul !
- Couper l'alimentation ou arrêter le moteur avant de procéder à l'installation, à la réparation ou à l'entretien de l'appareil. Déverrouiller l'alimentation selon la norme OSHA 29 CFR 1910.147 (voir normes de sécurité).
- Installer le poste correctement et le mettre à la terre convenablement selon les consignes du manuel de l'opérateur et les normes nationales, provinciales et locales.
- Toujours vérifier la terre du cordon d'alimentation. Vérifier et s'assurer que le fil de terre du cordon d'alimentation est bien raccordé à la borne de terre du sectionneur ou que la fiche du cordon est raccordée à une prise correctement mise à la terre.
- En effectuant les raccordements d'entrée, fixer d'abord le conducteur de mise à la terre approprié et contre-vérifier les connexions.
- Vérifier fréquemment le cordon d'alimentation afin de s'assurer qu'il n'est pas altéré ou à nu, le remplacer immédiatement s'il l'est. Un fil à nu peut entraîner la mort.
- L'équipement doit être hors tension lorsqu'il n'est pas utilisé.
- Ne pas utiliser des câbles usés, endommagés, de grosseur insuffisante ou mal épissés.
- Ne pas enrouler les câbles autour du corps.
- Si la pièce soudée doit être mise à la terre, le faire directement avec un câble distinct.
- Ne pas toucher l'électrode quand on est en contact avec la pièce, la terre ou une électrode provenant d'une autre machine.
- Ne pas toucher des porte électrodes connectés à deux machines en même temps à cause de la présence d'une tension à vide doublée.
- N'utiliser qu'un matériel en bon état. Réparer ou remplacer sur-le-champ les pièces endommagées. Entretenir l'appareil conformément à ce manuel.
- Porter un harnais de sécurité si l'on doit travailler au-dessus du sol.
- S'assurer que tous les panneaux et couvercles sont correctement en place.
- Fixer le câble de retour de façon à obtenir un bon contact métal-métal avec la pièce à souder ou la table de travail, le plus près possible de la soudure.
- Isoler la pince de masse quand pas mis à la pièce pour éviter le contact avec tout objet métallique.
- Ne pas raccorder plus d'une électrode ou plus d'un câble de masse à une même borne de sortie de soudage.

Il reste une TENSION DC NON NÉGLIGEABLE dans les sources de soudage onduleur quand on a coupé l'alimentation.

- Arrêter les convertisseurs, débrancher le courant électrique et décharger les condensateurs d'alimentation selon les instructions indiquées dans la partie Entretien avant de toucher les pièces.

LES FUMÉES ET LES GAZ peuvent être dangereux.

Le soudage génère des fumées et des gaz. Leur inhalation peut être dangereuse pour la santé.

- Ne pas mettre sa tête au-dessus des vapeurs. Ne pas respirer ces vapeurs.
- À l'intérieur, ventiler la zone et/ou utiliser une ventilation forcée au niveau de l'arc pour l'évacuation des fumées et des gaz de soudage.
- Si la ventilation est médiocre, porter un respirateur anti-vapeurs approuvé.
- Lire et comprendre les spécifications de sécurité des matériaux (MSDS) et les instructions du fabricant concernant les métaux, les consommables, les revêtements, les nettoyants et les dégraisseurs.
- Travailler dans un espace fermé seulement s'il est bien ventilé ou en portant un respirateur à alimentation d'air. Demander toujours à un surveillant dûment formé de se tenir à proximité. Des fumées et des gaz de soudage peuvent déplacer l'air et abaisser le niveau d'oxygène provoquant des blessures ou des accidents mortels. S'assurer que l'air de respiration ne présente aucun danger.
- Ne pas souder dans des endroits situés à proximité d'opérations de dégraissage, de nettoyage ou de pulvérisation. La chaleur et les rayons de l'arc peuvent réagir en présence de vapeurs et former des gaz hautement toxiques et irritants.
- Ne pas souder des métaux munis d'un revêtement, tels que l'acier galvanisé, plaqué en plomb ou au cadmium à moins que le revêtement n'ait été enlevé dans la zone de soudure, que l'endroit soit bien ventilé et en portant un respirateur à alimentation d'air. Les revêtements et tous les métaux renfermant ces éléments peuvent dégager des fumées toxiques en cas de soudage.

LES RAYONS D'ARC peuvent entraîner des brûlures aux yeux et à la peau.

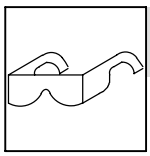
Le rayonnement de l'arc du procédé de soudage génère des rayons visibles et invisibles intenses (ultraviolets et infrarouges) susceptibles de provoquer des brûlures dans les yeux et sur la peau. Des étincelles sont projetées pendant le soudage.

- Porter un casque de soudage approuvé muni de verres filtrants approprié pour protéger visage et yeux pendant le soudage (voir ANSI Z49.1 et Z87.1 énuméré dans les normes de sécurité).
- Porter des lunettes de sécurité avec écrans latéraux même sous votre casque.
- Avoir recours à des écrans protecteurs ou à des rideaux pour protéger les autres contre les rayonnements les éblouissements et les étincelles ; prévenir toute personne sur les lieux de ne pas regarder l'arc.
- Porter des vêtements confectionnés avec des matières résistantes et ignifuges (cuir, coton lourd ou laine) et des bottes de protection.

LE SOUDAGE peut provoquer un incendie ou une explosion.

Le soudage effectué sur des conteneurs fermés tels que des réservoirs, tambours ou des conduites peut provoquer leur éclatement. Des étincelles peuvent être projetées de l'arc de soudure. La projection d'étincelles, des pièces chaudes et des équipements chauds peuvent provoquer des incendies et des brûlures. Le contact accidentel de l'électrode avec des objets métalliques peut provoquer des étincelles, une explosion, une surchauffe ou un incendie. Avant de commencer le soudage, vérifier et s'assurer que l'endroit ne présente pas de danger.

- Déplacer toutes les substances inflammables à une distance de 10,7 m de l'arc de soudage. En cas d'impossibilité, les recouvrir soigneusement avec des protections homologuées.
- Ne pas souder dans un endroit où des étincelles peuvent tomber sur des substances inflammables.
- Se protéger, ainsi que toute autre personne travaillant sur les lieux, contre les étincelles et le métal chaud.
- Des étincelles et des matériaux chauds du soudage peuvent facilement passer dans d'autres zones en traversant de petites fissures et des ouvertures.
- Afin d'éliminer tout risque de feu, être vigilant et garder toujours un extincteur à la portée de main.
- Le soudage effectué sur un plafond, plancher, paroi ou séparation peut déclencher un incendie de l'autre côté.
- Ne pas effectuer le soudage sur des conteneurs fermés tels que des réservoirs, tambours, ou conduites, à moins qu'ils n'aient été préparés correctement conformément à AWS F4.1 (voir les normes de sécurité).
- Brancher le câble de masse sur la pièce le plus près possible de la zone de soudage pour éviter le transport du courant sur une longue distance par des chemins inconnus éventuels en provoquant des risques d'électrocution, d'étincelles et d'incendie.
- Ne pas utiliser le poste de soudage pour dégeler des conduites gelées.
- En cas de non-utilisation, enlever la baguette d'électrode du porte-électrode ou couper le fil à la pointe de contact.
- Porter des vêtements de protection exempts d'huile tels que des gants en cuir, une veste résistante, des pantalons sans revers, des bottes et un casque.
- Avant de souder, retirer toute substance combustible de ses poches telles qu'un allumeur au butane ou des allumettes.
- Suivre les consignes de OSHA 1910.252 (a) (2) (iv) et de NFPA 51B pour travaux de soudage et prévoir un détecteur d'incendie et un extincteur à proximité.



DES PARTICULES VOLANTES peuvent blesser les yeux.

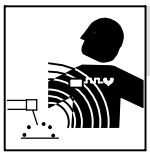
- Le soudage, l'écaillement, le passage de la pièce à la brosse en fil de fer, et le meulage génèrent des étincelles et des particules métalliques volantes. Pendant la période de refroidissement des soudures, elles risquent de projeter du laitier.
- Porter des lunettes de sécurité avec écrans latéraux ou un écran facial.

LES ACCUMULATIONS DE GAZ risquent de provoquer des blessures ou même la mort.

- Fermer l'alimentation du gaz protecteur en cas de non-utilisation.
- Veiller toujours à bien aérer les espaces confinés ou se servir d'un respiratoire d'adduction d'air homologué.

DES PIÈCES CHAUDES peuvent provoquer des brûlures graves.

- Ne pas toucher des parties chaudes à mains nues.
- Prévoir une période de refroidissement avant d'utiliser le pistolet ou la torche.
- Ne pas toucher aux pièces chaudes, utiliser les outils recommandés et porter des gants de soudage et des vêtements épais pour éviter les brûlures.



LES CHAMPS MAGNÉTIQUES peuvent affecter les stimulateurs cardiaques.

- Porteurs de stimulateur cardiaque, rester à distance.
- Les porteurs d'un stimulateur cardiaque doivent d'abord consulter leur médecin avant de s'approcher des opérations de soudage à l'arc, de gougeage ou de soudage par points.

LE BRUIT peut endommager l'ouïe.

Le bruit des processus et des équipements peut affecter l'ouïe.

- Porter des protections approuvées pour les oreilles si le niveau sonore est trop élevé.

LES BOUTEILLES peuvent exploser si elles sont endommagées.

Des bouteilles de gaz protecteur contiennent du gaz sous haute pression. Si une bouteille est endommagée, elle peut exploser. Du fait que les bouteilles de gaz font normalement partie du procédé de soudage, les manipuler avec précaution.

- Protéger les bouteilles de gaz comprimé d'une chaleur excessive, des chocs mécaniques, des dommages physiques, du laitier, des flammes ouvertes, des étincelles et des arcs.
- Placer les bouteilles debout en les fixant dans un support stationnaire ou dans un porte-bouteilles pour les empêcher de tomber ou de se renverser.
- Tenir les bouteilles éloignées des circuits de soudage ou autres circuits électriques.
- Ne jamais placer une torche de soudage sur une bouteille à gaz.
- Une électrode de soudage ne doit jamais entrer en contact avec une bouteille.
- Ne jamais souder une bouteille pressurisée – risque d'explosion.
- Utiliser seulement des bouteilles de gaz protecteur, régulateurs, tuyaux et raccords convenables pour cette application spécifique ; les maintenir ainsi que les éléments associés en bon état.
- Détourner votre visage du détendeur-régulateur lorsque vous ouvrez la soupape de la bouteille.
- Le couvercle du détendeur doit toujours être en place, sauf lorsque la bouteille est utilisée ou qu'elle est reliée pour usage ultérieur.
- Utiliser les équipements corrects, les bonnes procédures et suffisamment de personnes pour soulever et déplacer les bouteilles.
- Lire et suivre les instructions sur les bouteilles de gaz comprimé, l'équipement connexe et le dépliant P-1 de la CGA (Compressed Gas Association) mentionné dans les principales normes de sécurité.

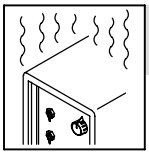
2-3. Dangers supplémentaires en relation avec l'installation, le fonctionnement et la maintenance

Risque D'INCENDIE OU D'EXPLOSION.

- Ne pas placer l'appareil sur, au-dessus ou à proximité de surfaces inflammables.
- Ne pas installer l'appareil à proximité de produits inflammables.
- Ne pas surcharger l'installation électrique – s'assurer que l'alimentation est correctement dimensionnée et protégée avant de mettre l'appareil en service.

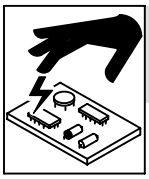
LA CHUTE DE L'APPAREIL peut blesser.

- Utiliser l'anneau de levage uniquement pour soulever l'appareil, NON PAS les chariots, les bouteilles de gaz ou tout autre accessoire.
- Utiliser un équipement de levage de capacité suffisante pour lever l'appareil.
- En utilisant des fourches de levage pour déplacer l'unité, s'assurer que les fourches sont suffisamment longues pour dépasser du côté opposé de l'appareil.



L'EMPLOI EXCESSIF peut SURCHAUFFER L'ÉQUIPEMENT.

- Prévoir une période de refroidissement ; respecter le cycle opératoire nominal.
- Réduire le courant ou le facteur de marche avant de poursuivre le soudage.
- Ne pas obstruer les passages d'air du poste.



LES CHARGES ÉLECTROSTATIQUES peuvent endommager les circuits imprimés.

- Établir la connexion avec la barrette de terre avant de manipuler des cartes ou des pièces.
- Utiliser des pochettes et des boîtes antistatiques pour stocker, déplacer ou expédier des cartes PC.

DES ORGANES MOBILES peuvent provoquer des blessures.

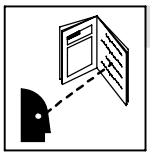
- Ne pas s'approcher des organes mobiles.
- Ne pas s'approcher des points de coincement tels que des rouleaux de commande.

LES FILS DE SOUDAGE peuvent provoquer des blessures.

- Ne pas appuyer sur la gâchette avant d'en avoir reçu l'instruction.
- Ne pas diriger le pistolet vers soi, d'autres personnes ou toute pièce mécanique en engageant le fil de soudage.

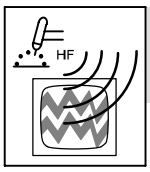
DES ORGANES MOBILES peuvent provoquer des blessures.

- S'abstenir de toucher des organes mobiles tels que des ventilateurs.
- Maintenir fermés et verrouillés les portes, panneaux, recouvrements et dispositifs de protection.
- Seules des personnes qualifiées sont autorisées à enlever les portes, panneaux, recouvrements ou dispositifs de protection pour l'entretien.
- Remettre les portes, panneaux, recouvrements ou dispositifs de protection quand l'entretien est terminé et avant de rebrancher l'alimentation électrique.



LIRE LES INSTRUCTIONS.

- Lire le manuel d'utilisation avant d'utiliser ou d'intervenir sur l'appareil.
- Utiliser uniquement des pièces de rechange Miller/Hobart.



LE RAYONNEMENT HAUTE FRÉQUENCE (HF) risque de provoquer des interférences.

- Le rayonnement haute fréquence (HF) peut provoquer des interférences avec les équipements de radio-navigation et de communication, les services de sécurité et les ordinateurs.
- Demander seulement à des personnes qualifiées familiarisées avec des équipements électroniques de faire fonctionner l'installation.
- L'utilisateur est tenu de faire corriger rapidement par un électricien qualifié les interférences résultant de l'installation.
- Si le FCC signale des interférences, arrêter immédiatement l'appareil.
- Effectuer régulièrement le contrôle et l'entretien de l'installation.
- Maintenir soigneusement fermés les portes et les panneaux des sources de haute fréquence, maintenir les éclateurs à une distance correcte et utiliser une terre et un blindage pour réduire les interférences éventuelles.

LE SOUDAGE À L'ARC risque de provoquer des interférences.

- L'énergie électromagnétique peut gêner le fonctionnement d'appareils électroniques comme des ordinateurs et des robots.
- Veiller à ce que tout l'équipement de la zone de soudage soit compatible électromagnétiquement.
- Pour réduire la possibilité d'interférence, maintenir les câbles de soudage aussi courts que possible, les grouper, et les poser aussi bas que possible (ex. par terre).
- Veiller à souder à une distance de 100 mètres de tout équipement électronique sensible.
- Veiller à ce que ce poste de soudage soit posé et mis à la terre conformément à ce mode d'emploi.
- En cas d'interférences après avoir pris les mesures précédentes, il incombe à l'utilisateur de prendre des mesures supplémentaires telles que le déplacement du poste, l'utilisation de câbles blindés, l'utilisation de filtres de ligne ou la pose de protecteurs dans la zone de travail.

2-4. Proposition californienne 65 Avertissements

▲ **Les équipements de soudage et de coupage produisent des fumées et des gaz qui contiennent des produits chimiques dont l'État de Californie reconnaît qu'ils provoquent des malformations congénitales et, dans certains cas, des cancers. (Code de santé et de sécurité de Californie, chapitre 25249.5 et suivants)**

▲ **Les batteries, les bornes et autres accessoires contiennent du plomb et des composés à base de plomb, produits chimiques dont l'État de Californie reconnaît qu'ils provoquent des cancers et des malformations congénitales ou autres problèmes de procréation. Se laver les mains après manipulation.**

Pour les moteurs à essence :

▲ **Les gaz d'échappement des moteurs contiennent des produits chimiques dont l'État de Californie reconnaît qu'ils provoquent des cancers et des malformations congénitales ou autres problèmes de procréation.**

Pour les moteurs diesel :

▲ **Les gaz d'échappement des moteurs diesel et certains de leurs composants sont reconnus par l'État de Californie comme provoquant des cancers et des malformations congénitales ou autres problèmes de procréation.**

2-5. Principales normes de sécurité

Safety in Welding, Cutting, and Allied Processes, ANSI Standard Z49.1, de Global Engineering Documents (téléphone : 1-877-413-5184, site Internet : www.global.ihs.com).

Recommended Safe Practices for the Preparation for Welding and Cutting of Containers and Piping, American Welding Society Standard AWS F4.1 de Global Engineering Documents (téléphone : 1-877-413-5184, site Internet : www.global.ihs.com).

National Electrical Code, NFPA Standard 70, de National Fire Protection Association, P.O. Box 9101, 1 Battery March Park, Quincy, MA 02269-9101 (téléphone : 617-770-3000, site Internet : www.nfpa.org).

Safe Handling of Compressed Gases in Cylinders, CGA Pamphlet P-1, de Compressed Gas Association, 1735 Jefferson Davis Highway, Suite 1004, Arlington, VA 22202-4102 (téléphone : 703-412-0900, site Internet : www.cganet.com).

Code for Safety in Welding and Cutting, CSA Standard W117.2, de Canadian Standards Association, Standards Sales, 178 Rexdale Boulevard, Rexdale, Ontario, Canada M9W 1R3 (téléphone : 800-463-6727 ou à Toronto 416-747-4044, site Internet : www.csa-international.org).

Practice For Occupational And Educational Eye And Face Protection, ANSI Standard Z87.1, de American National Standards Institute, 11 West 42nd Street, New York, NY 10036-8002 (téléphone : 212-642-4900, site Internet : www.ansi.org).

Standard for Fire Prevention During Welding, Cutting, and Other Hot Work, NFPA Standard 51B, de National Fire Protection Association, P.O. Box 9101, 1 Battery March Park, Quincy, MA 02269-9101 (téléphone : 617-770-3000, site Internet : www.nfpa.org).

OSHA, Occupational Safety and Health Standards for General Industry, Title 29, Code of Federal Regulations (CFR), Part 1910, Subpart Q, and Part 1926, Subpart J, de U.S. Government Printing Office, Superintendent of Documents, P.O. Box 371954, Pittsburgh, PA 15250 (il y a 10 bureaux régionaux––le téléphone de la région 5, Chicago, est 312-353-2220, site Internet : www.osha.gov).

2-6. Information EMF

Considérations sur le soudage et les effets de basse fréquence et des champs magnétiques et électriques.

Le courant de soudage, pendant son passage dans les câbles de soudage, causera des champs électromagnétiques. Il y a eu et il y a encore un certain souci à propos de tels champs. Cependant, après avoir examiné plus de 500 études qui ont été faites pendant une période de recherche de 17 ans, un comité spécial ruban bleu du National Research Council a conclu : « L'accumulation de preuves, suivant le jugement du comité, n'a pas démontré que l'exposition aux champs magnétiques et champs électriques à haute fréquence représente un risque à la santé humaine ». Toutefois, des études sont toujours en cours et les preuves continuent à être examinées. En attendant que les conclusions finales de la recherche soient établies, il vous serait souhaitable de réduire votre exposition aux champs électromagnétiques pendant le soudage ou le coupage.

Pour réduire les champs magnétiques sur le poste de travail, appliquer les procédures suivantes :

1. Maintenir les câbles ensemble en les tordant ou en les enveloppant.
2. Disposer les câbles d'un côté et à distance de l'opérateur.
3. Ne pas courber pas et ne pas entourer pas les câbles autour de votre corps.
4. Garder le poste de soudage et les câbles le plus loin possible de vous.
5. Connecter la pince sur la pièce aussi près que possible de la soudure.

En ce qui concerne les stimulateurs cardiaques

Les porteurs de stimulateur cardiaque doivent consulter leur médecin avant de souder ou d'approcher des opérations de soudage. Si le médecin approuve, il est recommandé de suivre les procédures précédentes.

SECTION 3 – DEFINITIONS

3-1. Symbols And Definitions

Wire Feed	Output	Duty Cycle	Do Not Switch While Welding
Volts	Increase	On	Off
Gas Metal Arc Welding (GMAW) Gun	Wire Feed Spool Gun	Gas Input	Gas Output
Voltage Input	Press To Reset	Rated No-Load Voltage (Average)	

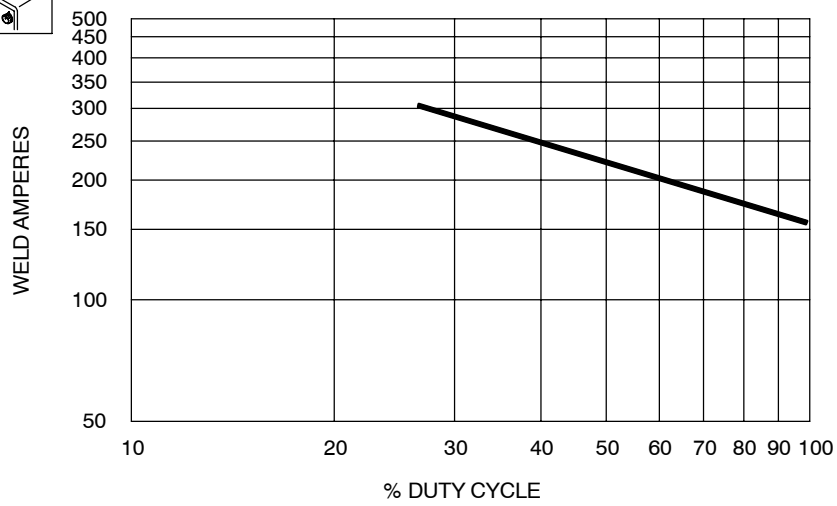
SECTION 4 – INSTALLATION

4-1. Specifications

Rated Output		Max. Open-Circuit Voltage	Amps Input at Rated Output (60% Duty Cycle), 50 or 60 Hz, Single-Phase						
			200 (208) V	230 V	400 V	460 V	575 V	KVA	KW
250 A at 28 VDC, 40% Duty Cycle	200 A at 28 VDC, 60% Duty Cycle	38	48 2.3*	42 2*	24 1.2*	21 1*	17 0.8*	9.8 0.46*	7.5 0.13*

Wire Type and Diameter			Wire Feed Speed	Dimensions	Net Weight
Solid Steel	**Stainless Steel**	**Flux Cored**	25–700 IPM (.65–17.8 m/min)	H: 32 in (813 mm) W: 19 in (483 mm) D: 39 in (991 mm)	**215 lb (98 kg)**
.023 – .045 in (0.6 – 1.2 mm)	.023 – .045 in (0.6 – 1.2 mm)	.030 – .045 in (0.8 – 1.2 mm)			
* While idling					
Operating Temperature Range – –20C to +40C			Storage Temperature Range – -30C to + 50C		

4-2. Welding Power Source Duty Cycle And Overheating

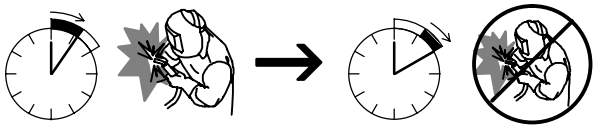


Duty Cycle is percentage of 10 minutes that unit can weld at rated load without overheating.

If unit overheats, Thermistor (T) opens, output stops, and cooling fan runs. Wait fifteen minutes for unit to cool. Reduce amperage or voltage, or duty cycle before welding.

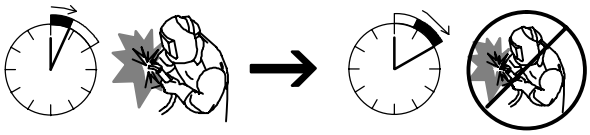
▲ **Exceeding duty cycle can damage unit and void warranty.**

60% Duty Cycle At 200 Amperes



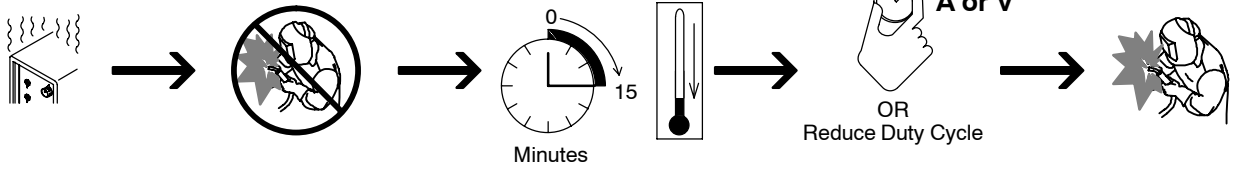
6 Minutes Welding — 4 Minutes Resting

40% Duty Cycle At 250 Amperes



4 Minutes Welding — 6 Minutes Resting

Overheating



duty1 4/95 – 150 215-A

4-3. Welding Gun Duty Cycle And Overheating

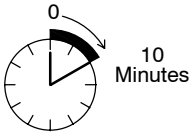
⚠ CAUTION

WELDING LONGER THAN RATED DUTY CYCLE can damage gun and void warranty.

- Do not weld at rated load longer than shown below.
- Using gasless flux cored wire reduces gun duty cycle.

warn7.1 8/93

Definition

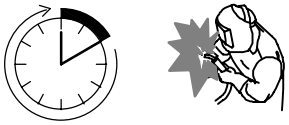


Duty Cycle is percentage of 10 minutes that gun can weld at rated load without overheating.

.023 To .045 in (0.6 To 1.1 mm) Hard Or Flux Cored Wires

100% Duty Cycle At 200 Amperes Using CO_2

100% Duty Cycle At 150 Amperes Using Mixed Gases

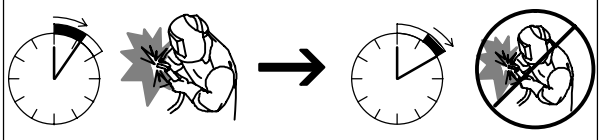


Continuous Welding

.023 To .045 in (0.6 To 1.1 mm) Hard Or Flux Cored Wires

60% Duty Cycle At 300 Amperes Using CO_2

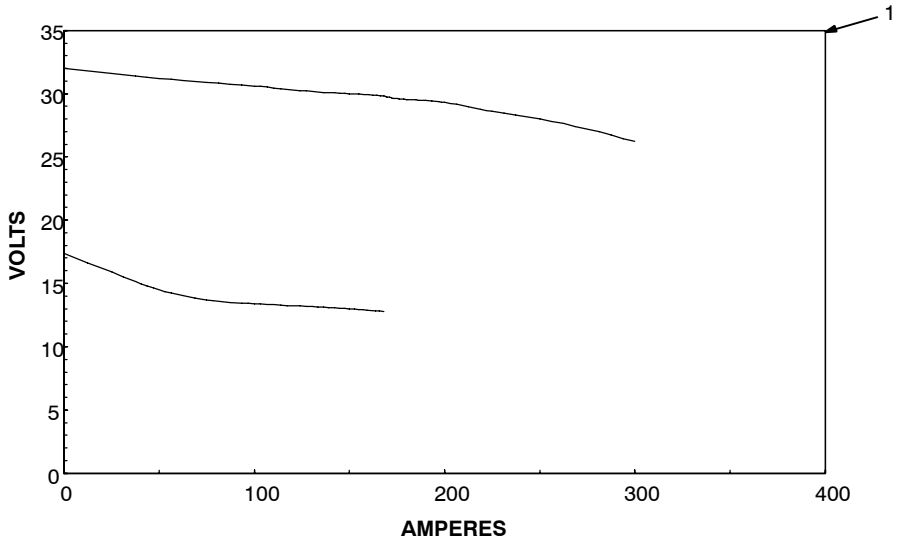
60% Duty Cycle At 200 Amperes Using Mixed Gases



6 Minutes Welding — 4 Minutes Resting

SB1.1 8/93

4-4. Volt-Ampere Curves

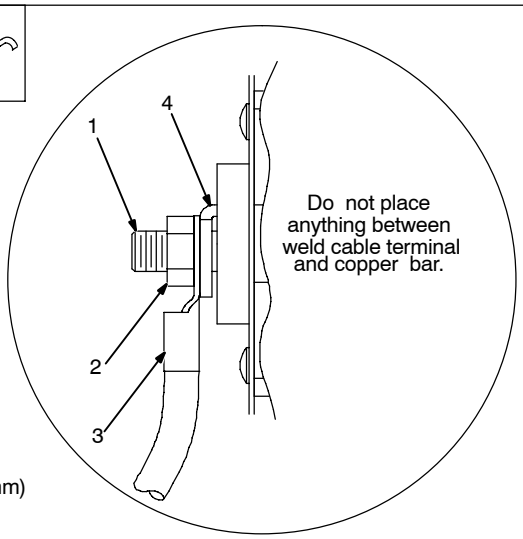


1 Normal Volt-Ampere Curves

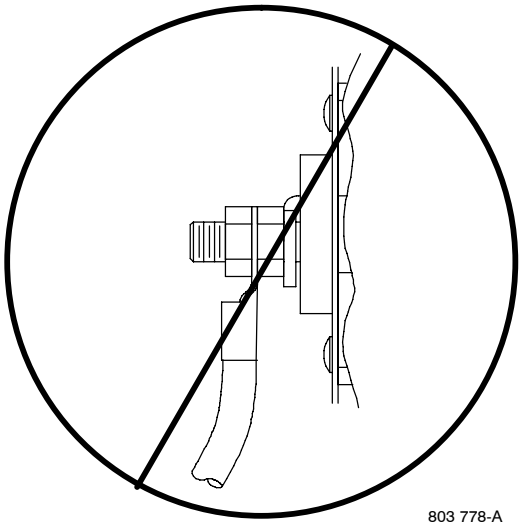
The volt-ampere curves show the normal minimum and maximum voltage and amperage output capabilities of the welding power source. Curves of other settings fall between the curves shown.

ssb1.1 10/91 – 196 844 / S-0700

4-5. Connecting To Weld Output Terminals



Correct Installation



803 778-A

Incorrect Installation

Tools Needed:

3/4 in (19 mm)

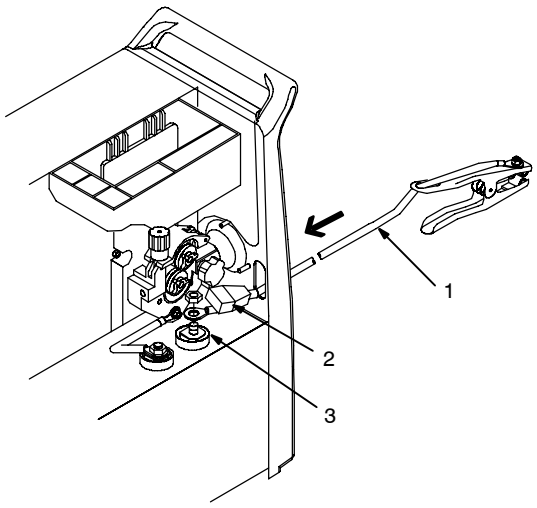
▲ **Turn off power before connecting to weld output terminals.**

▲ **Failure to properly connect weld cables may cause excessive heat and start a fire, or damage your machine.**

1 Weld Output Terminal
2 Supplied Weld Output Terminal Nut
3 Weld Cable Terminal
4 Copper Bar

Remove supplied nut from weld output terminal. Slide weld cable terminal onto weld output terminal and secure with nut so that weld cable terminal is tight against copper bar. **Do not place anything between weld cable terminal and copper bar. Make sure that the surfaces of the weld cable terminal and copper bar are clean.**

4-6. Installing Work Cable And Clamp



1 Work Cable

2 Boot

Route cable through front panel opening. Slide boot onto work cable.

3 Negative (–) Output Terminal

Connect cable to terminal and cover connection with boot.

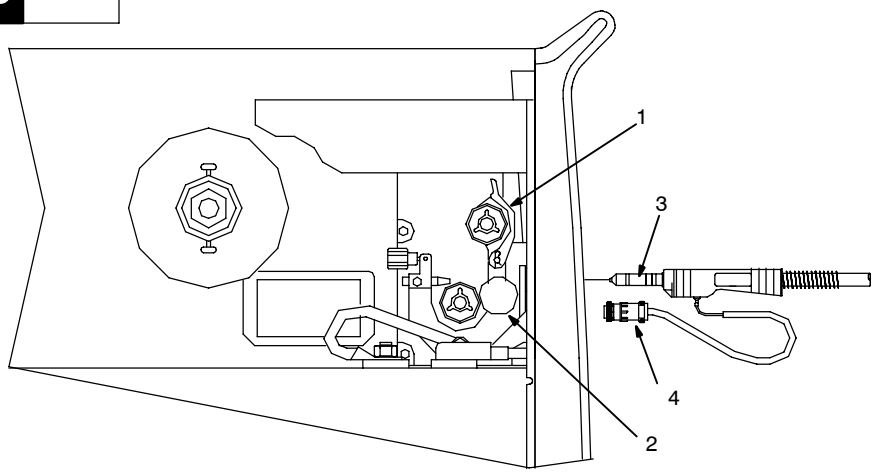
Close door.

Tools Needed:

3/4 in

Ref. 802 474-E

4-7. Installing Welding Gun



1 Drive Assembly

2 Gun Securing Knob

3 Gun End

Loosen securing knob. Insert gun end through opening until it bottoms against drive assembly (make sure gun end does not touch drive rolls). Tighten knob.

4 Gun Trigger Plug

Insert plug into receptacle, and tighten threaded collar.

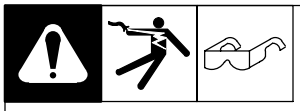
Close door.

Ref. 802 064-D

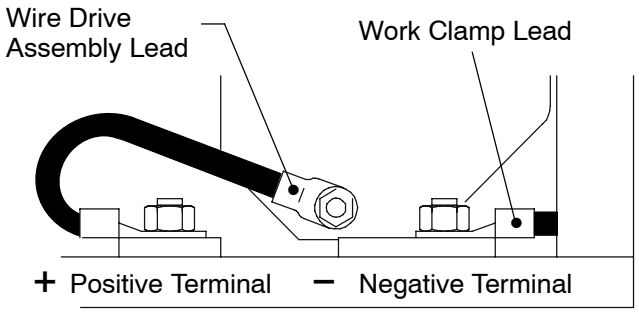
4-8. Connecting A Spoolmatic ® 15A Or 30A Gun

The Spoolmatic 15A or 30A welding gun connects directly to the 10-pin receptacle on the front of the welding power source – no adapter required. NOTE: Two welding guns may be connected to the welding power source at the same time, but only one welding gun may be in use at any one time. If the triggers of both welding guns are pulled at the same time, the weld output and wirefeed motor are disabled.

4-9. Setting Gun Polarity For Wire Type



Changing Polarity



1 Polarity Changeover Label Information

Always read and follow manufacture's recommended polarity.

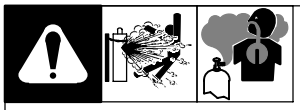
Shown as shipped – **Electrode Positive** (DCEP): For solid steel, stainless steel, aluminum, or flux core with gas wires (GMAW).

Electrode Negative (DCEN): Reverse lead connections at terminals from that shown above for gasless flux core wires (FCAW). Drive assembly becomes negative.

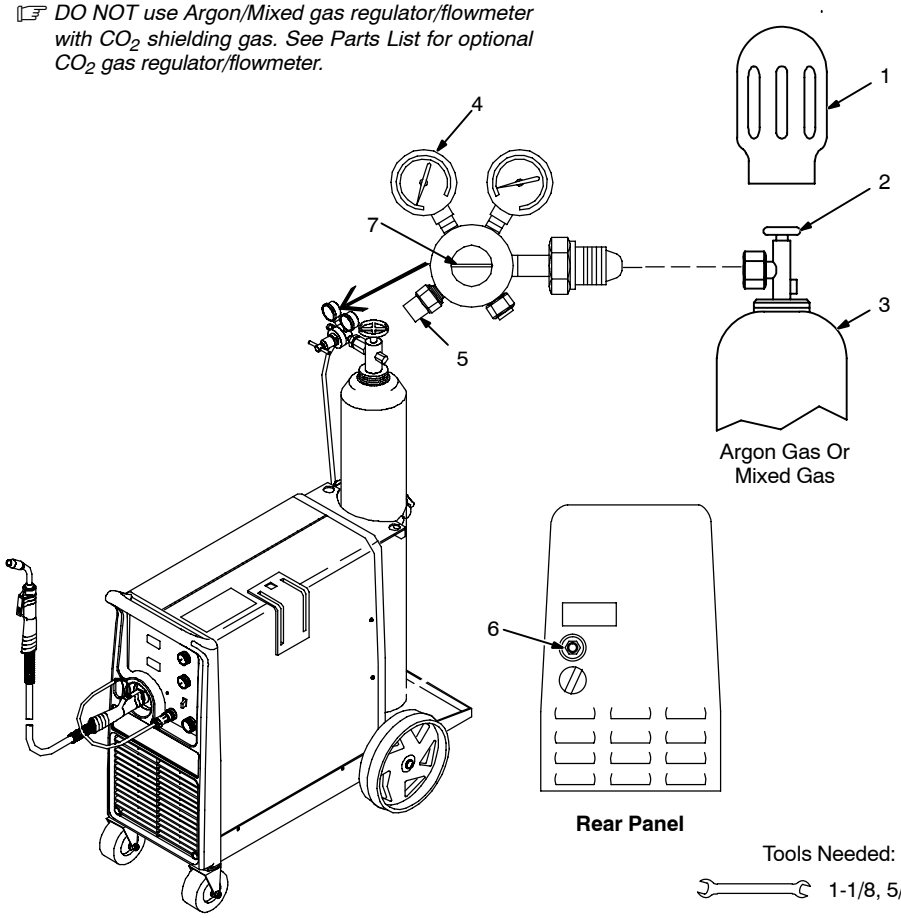
3/4, 11/16 in

Ref. 190 821-A

4-10. Installing Gas Supply



☞ *DO NOT use Argon/Mixed gas regulator/flowmeter with CO_2 shielding gas. See Parts List for optional CO_2 gas regulator/flowmeter.*



Obtain gas cylinder and chain to running gear, wall, or other stationary support so cylinder cannot fall and break off valve.

1 Cap

2 Cylinder Valve

Remove cap, stand to side of valve, and open valve slightly. Gas flow blows dust and dirt from valve. Close valve.

3 Cylinder

4 Regulator/Flowmeter

Install so face is vertical.

5 Regulator/Flowmeter Gas Hose Connection

6 Welding Power Source Gas Hose Connection

Connect customer supplied gas hose between regulator/flowmeter gas hose connection, and fitting on rear of welding power source.

7 Flow Adjust

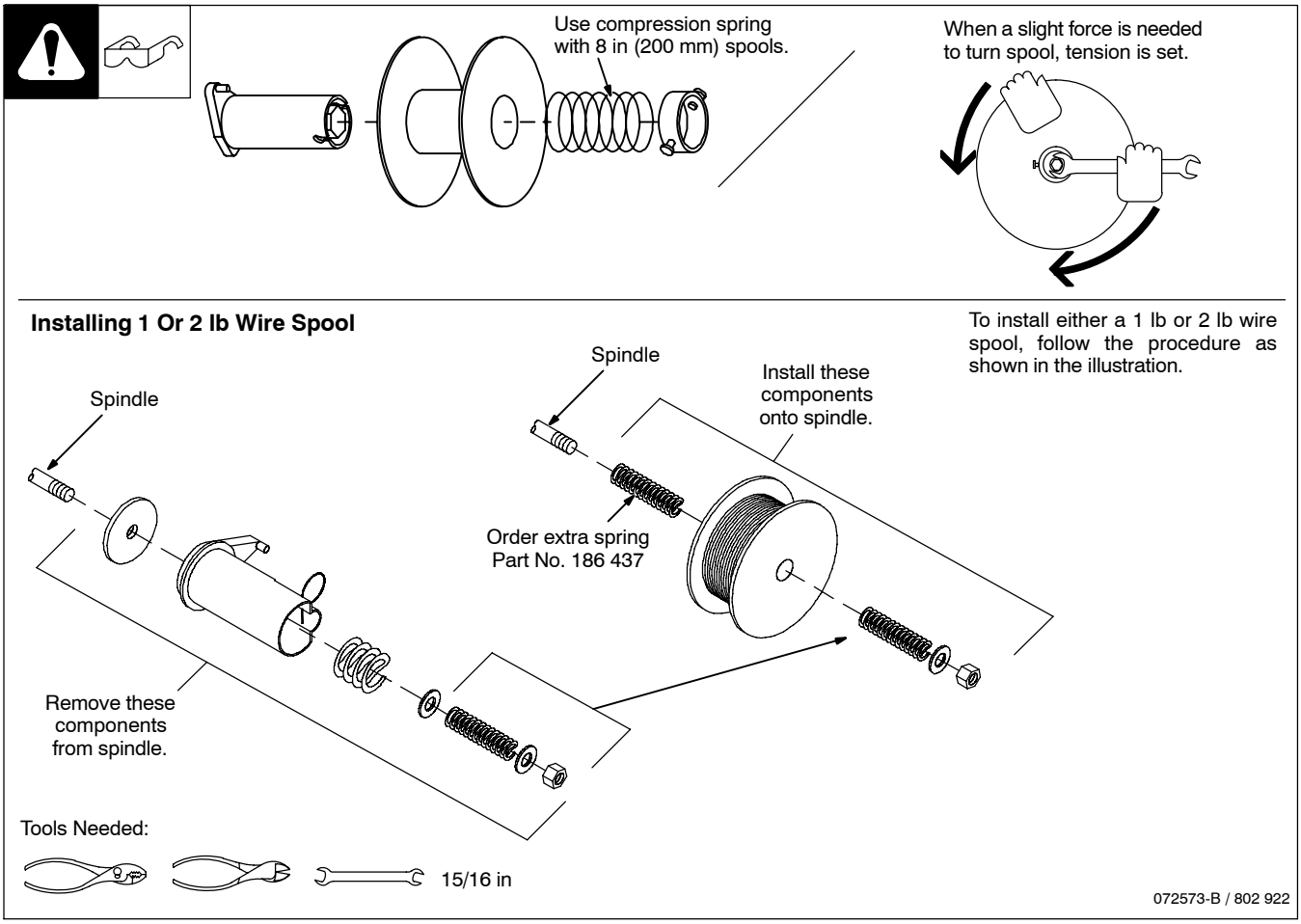
Typical flow rate is 20 cfh (cubic feet per hour). Check wire manufacturer's recommended flow rate.

Tools Needed:

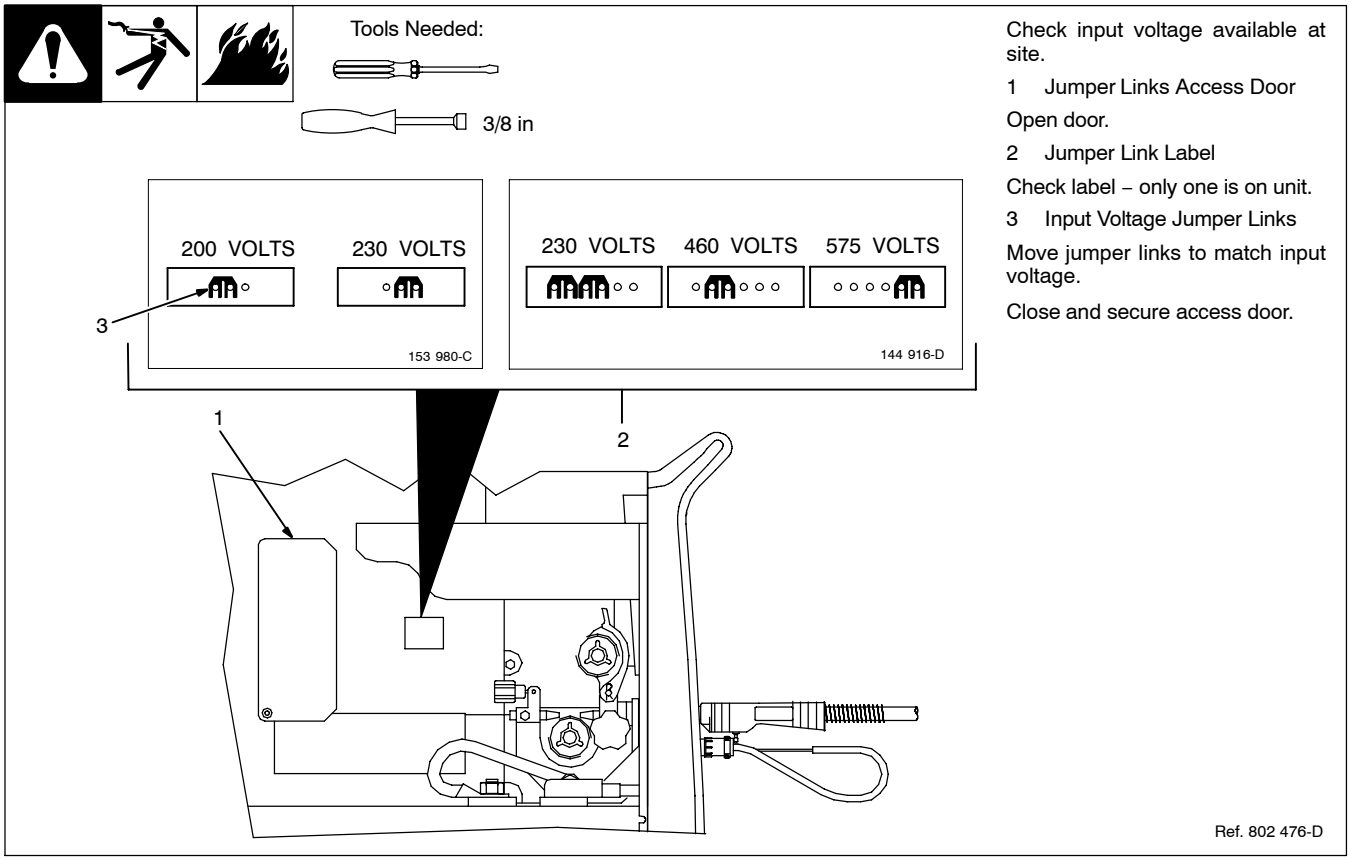
1-1/8, 5/8 in

802 028-A / Ref. 802 477-B

4-11. Installing Wire Spool And Adjusting Hub Tension


Use compression spring with 8 in (200 mm) spools.
When a slight force is needed to turn spool, tension is set.
Installing 1 Or 2 lb Wire Spool
To install either a 1 lb or 2 lb wire spool, follow the procedure as shown in the illustration.
Spindle
Spindle
Install these components onto spindle.
Order extra spring Part No. 186 437
Remove these components from spindle.
Tools Needed:
15/16 in
072573-B / 802 922

4-12. Positioning Jumper Links



4-13. Electrical Service Guide

Input Voltage	200	230	400	460	575
Input Amperes At Rated Output	48	42	24	21	17
Max Recommended Standard Fuse Or Circuit Breaker Rating In Amperes					
Circuit Breaker [1], Time-Delay [2]	60	50	30	25	20
Normal Operating [3]	70	60	35	30	25
Min Input Conductor Size In AWG[4]	8	8	12	12	14
Max Recommended Input Conductor Length In Feet (Meters)	96 (29)	127 (39)	156 (47)	206 (63)	209 (64)
Min Grounding Conductor Size In AWG[4]	8	10	12	12	14

Reference: 2005 National Electrical Code (NEC) (including article 630)

1 Choose a circuit breaker with time-current curves comparable to a Time Delay Fuse.

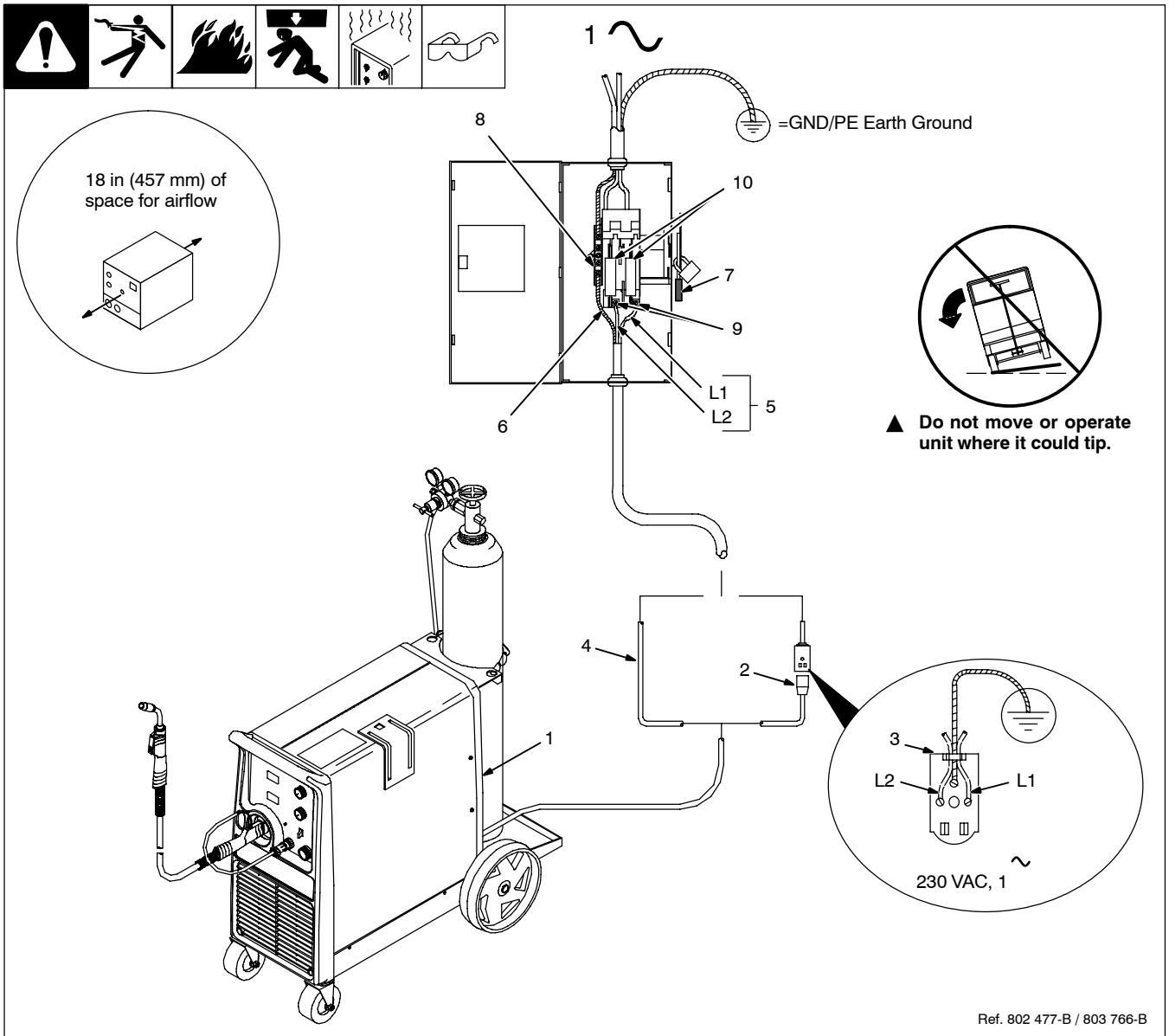
2 “Time-Delay” fuses are UL class “RK5” .

3 “Normal Operating” (general purpose – no intentional delay) fuses are UL class “K5” (up to and including 60 amp), and UL class “H” (65 amp and above).

4 Conductor data in this section specifies conductor size (excluding flexible cord or cable) between the panelboard and the equipment per NEC Table 310.16. If a flexible cord or cable is used, minimum conductor size may increase. See NEC Table 400.5(A) for flexible cord and cable requirements.

▲ **Caution: Failure to follow these fuse and circuit breaker recommendations could create an electric shock or fire hazard. These recommendations are for a dedicated branch circuit that applies to the rated output and duty cycle of the welding power source.**

4-14. Selecting A Location And Connecting Input Power



▲ **Installation must meet all National and Local Codes – have only qualified persons make this installation.**

▲ **Disconnect and lockout/tagout input power before connecting input conductors from unit.**

▲ **Always connect green or green/yellow conductor to supply grounding terminal first, and never to a line terminal.**

▲ **Special installation may be required where gasoline or volatile liquids are present – see NEC Article 511 or CEC Section 20.**

1 Rating Label

Supply correct input power.

2 Plug (NEMA Type 6-50P)

3 Receptacle [NEMA Type 6-50R (Customer Supplied)]

4 Input Power Cord.

Connect directly to line disconnect device if hard wiring is required.

5 Black And White Input Conductor (L1 And L2)

6 Green Or Green/Yellow Grounding Conductor

7 Disconnect Device (switch shown in the OFF position)

8 Disconnect Device Grounding Terminal

9 Disconnect Device Line Terminals

Connect green or green/yellow grounding conductor to disconnect device grounding terminal first.

Connect input conductors L1 and L2 to disconnect device line terminals.

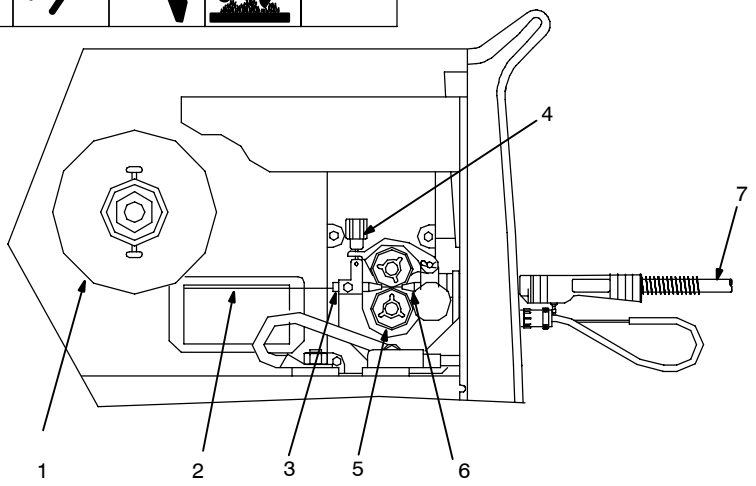
10 Over-Current Protection

Select type and size of over-current protection using Section 4-13 (fused disconnect switch shown).

Connect plug to receptacle if hard wiring method is not used.

Close and secure door on disconnect device. Remove lockout/tagout device, and place switch in the On position.

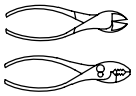
4-15. Threading Welding Wire

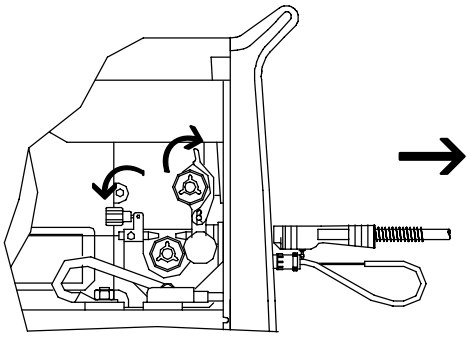


1 Wire Spool
2 Welding Wire
3 Inlet Wire Guide
4 Pressure Adjustment Knob
5 Drive Roll
6 Outlet Wire Guide
7 Gun Conduit Cable

Lay gun cable out straight.

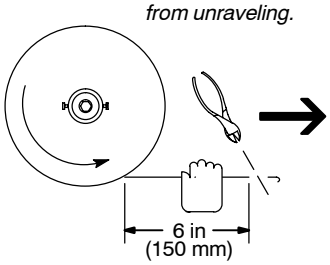
Tools Needed:



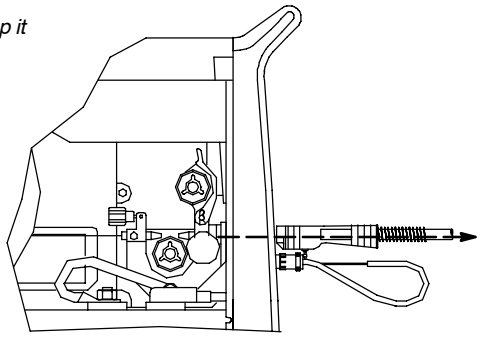


Open pressure assembly.

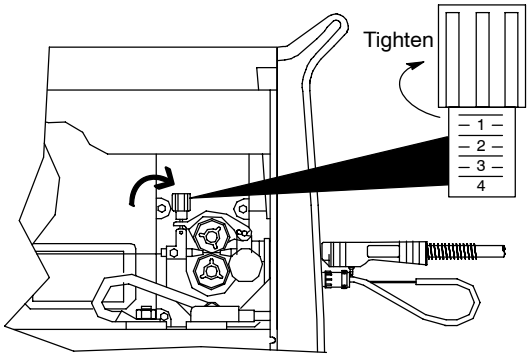
☞ *Hold wire tightly to keep it from unraveling.*



Pull and hold wire; cut off end.



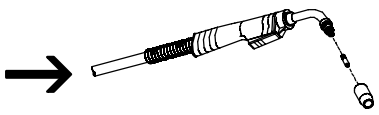
Push wire thru guides into gun; continue to hold wire.



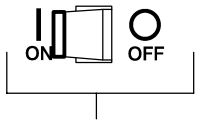
☞ *Use pressure indicator scale to set a desired drive roll pressure.*

Pressure Indicator Scale

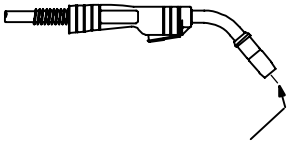
Close and tighten pressure assembly, and let go of wire.



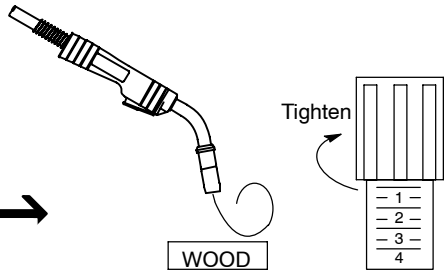
Remove gun nozzle and contact tip.



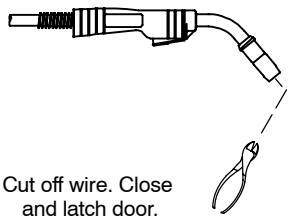
Turn On.



Press gun trigger until wire comes out of gun. Reinstall contact tip and nozzle



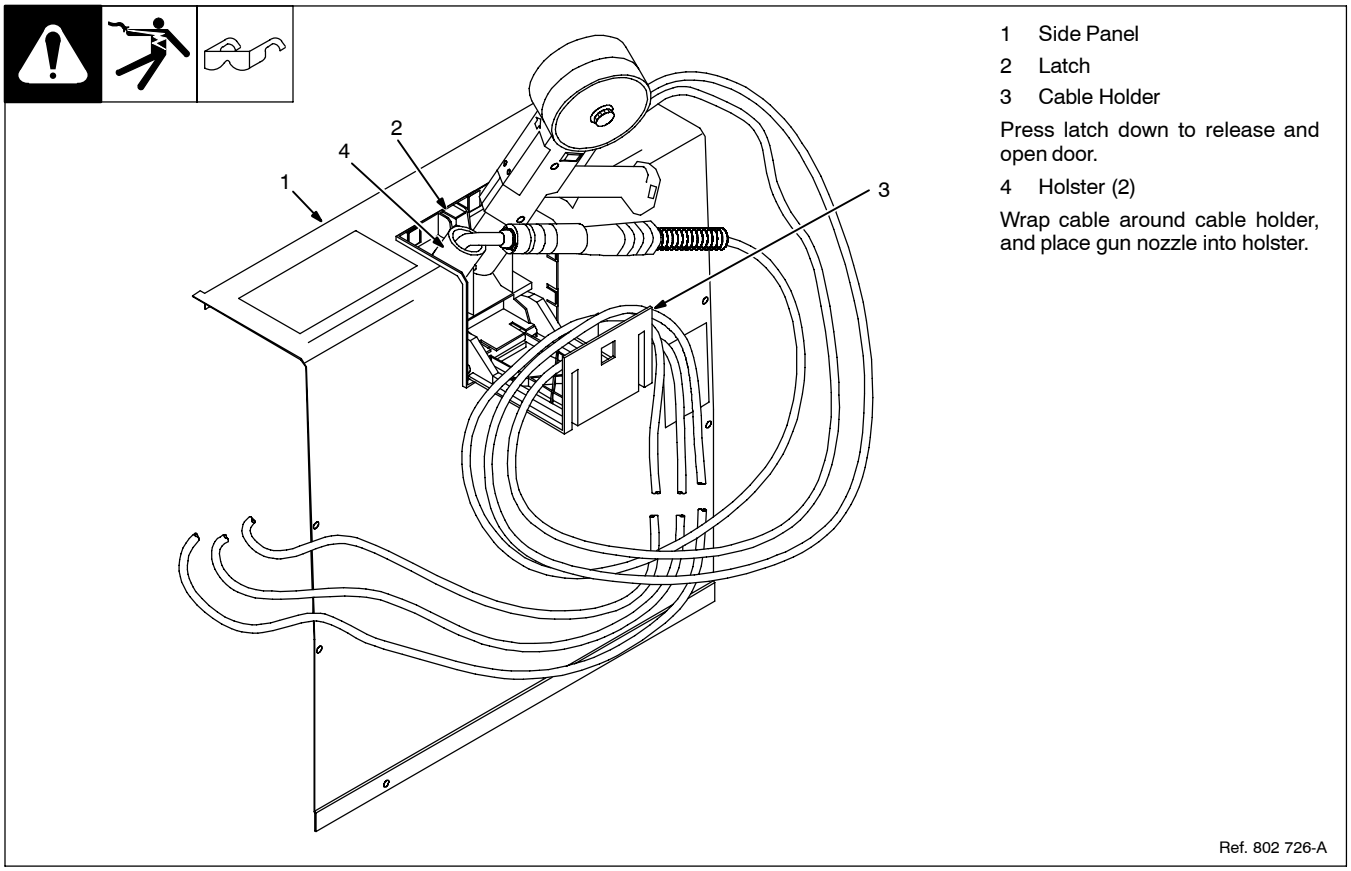
Feed wire to check drive roll pressure. Tighten knob enough to prevent slipping.



Cut off wire. Close and latch door.

Ref. 802 064-D / S-0627-A

4-16. Using Gun/Cable Holder



1 Side Panel

2 Latch

3 Cable Holder

Press latch down to release and open door.

4 Holster (2)

Wrap cable around cable holder, and place gun nozzle into holster.

Ref. 802 726-A

Notes

Selecting Wire, Gas and Control Settings

What Material are You Welding?	Suggested Wire Types	Suggested Shielding Gases and Flow Rate	Wire Sizes (Diameter)
Steel	Solid (or hard) ER70S-6	100% CO_2, 25 cfh	0.023" (0.6mm) 0.030" (0.8mm) 0.035" (0.9mm) 0.045" (1.1mm)
		75% Ar/25% CO_2, 25 cfh (Ar/CO_2 produces less spatter - better overall appearance)	0.023" (0.6mm) 0.030" (0.8mm) 0.035" (0.9mm) 0.045" (1.1mm)
Steel – for outdoor, windy applications or when weld appearance is not critical.	Flux core E71T-11	No shielding gas required	0.035" (0.9mm) 0.045" (1.1mm)
	Flux core E71T-1	100% CO_2, 25 cfh 75% Ar/25% CO_2, 25 cfh	0.035" (0.9mm) 0.045" (1.1mm)
Stainless steel	Stainless steel ER 308, ER 308L ER 308LSi	Tri-Mix, 35 cfh (90% He/7.5% Ar/2.5% CO_2)	0.023" (0.6mm) 0.030" (0.8mm) 0.035" (0.9mm) 0.045" (1.1mm)
Aluminum with Optional Spoolmatic®15A or 30A spoolgun.	Aluminum 4043 ER	100% Ar, 35 cfh	0.030" (0.8mm) 0.035" (0.9mm) 0.047" (1.2mm)

Select Voltage and Wire Speed Based on Thickness of Metal Being Welded

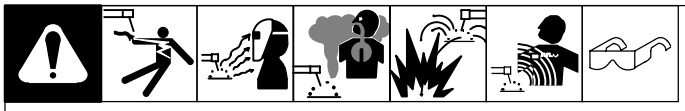
To read settings: Number on left of slash is voltage, number on right of slash is wire-speed. "—" Means not recommended.
Example: 19.2/398 = Wire speed listed is a starting value only and can be fine-tuned while welding.

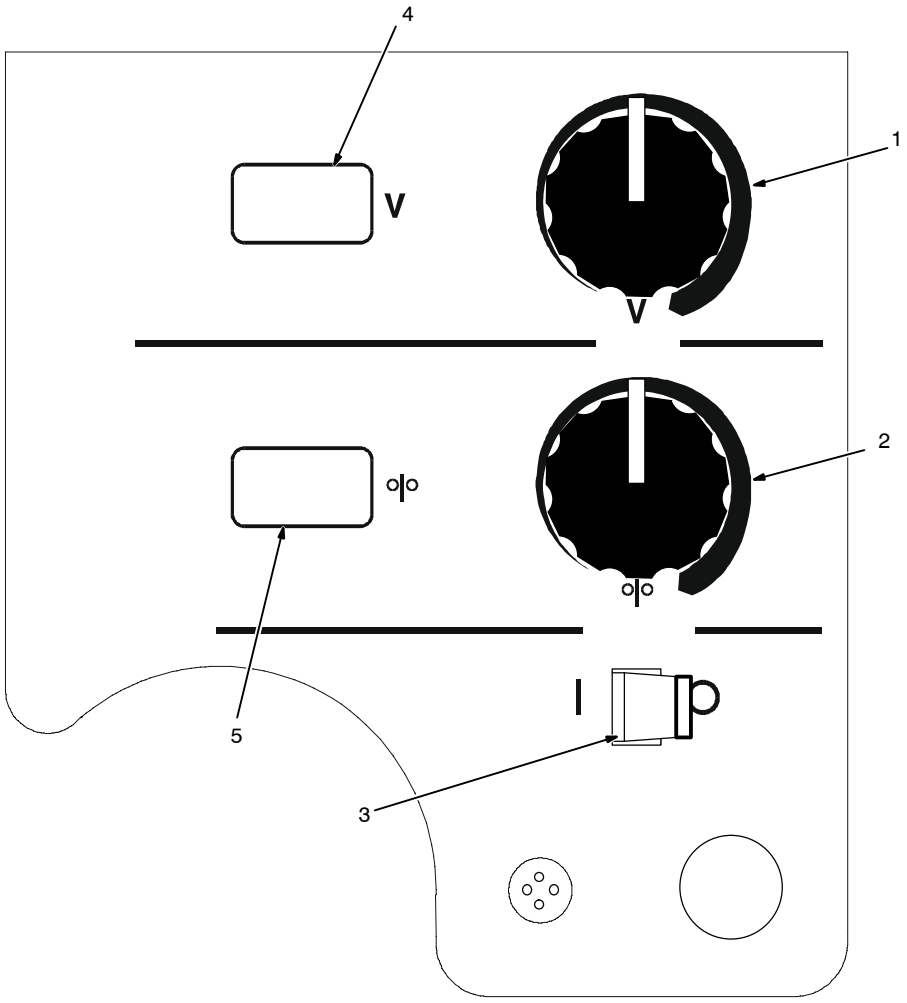
1/2" (12.7 mm)	3/8" (9.5 mm)	1/4" (6.4 mm)	3/16" (4.8 mm)	1/8" (3.2 mm)	14 ga. (2.0 mm)	16 ga. (1.6 mm)	18 ga. (1.2 mm)	20 ga. (0.9 mm)	22 ga. (0.8 mm)
—	—	—	—	20.0/320	19.0/280	18.5/220	18.0/190	17.6/170	17.0/140
—	22.5/420	21.5/380	20.5/325	19.5/295	19.0/230	18.5/185	18.0/135	17.5/120	17.0/105
—	23.0/325	21.5/290	20.5/245	20.0/220	19.0/175	18.5/160	18.0/125	17.5/100	17.0/85
—	—	—	19.5/510	18.0/385	17.0/300	16.5/240	15.5/180	15.3/140	15.0/130
—	22.0/530	19.6/435	18.5/375	17.0/305	16.5/235	16.0/210	15.5/170	15.0/130	14.5/110
23.5/475	21.5/425	19.0/320	18.0/280	17.0/245	16.5/200	16.0/165	15.5/135	15.0/110	14.5/95
24.5/335	21.5/300	19.0/260	18.0/230	17.0/200	16.5/165	16.0/155	15.5/110	—	—
—	16.5/250	15.5/225	15.0/210	14.5/180	14.2/120	14.0/105	—	—	—
—	17.5/170	16.5/130	15.5/110	15.0/90	14.5/70	—	—	—	—
—	24.0/385	23.0/360	21.5/310	20.5/275	20.0/250	—	—	—	—
25.5/380	24.5/340	23.0/305	21.5/265	20.5/240	20.0/210	—	—	—	—
—	—	—	—	21.0/500	19.5/360	18.5/270	18.0/250	—	—
—	—	22.5/500	21.5/480	21.0/420	19.5/360	18.5/250	17.5/220	—	—
—	24.5/485	22.5/440	21.5/400	20.0/350	19.0/275	18.5/225	—	—	—
—	24.0/330	22.5/310	21.5/285	20.5/275	—	—	—	—	—
—	—	23.0/570	21.0/500	19.0/450	18.5/425	—	—	—	—
—	25.0/615	23.0/520	21.5/450	19.0/400	18.5/375	—	—	—	—
—	24.5/445	22.5/375	21.0/305	19.0/265	—	—	—	—	—

201 202-A

SECTION 5 – OPERATION

5-1. Controls





☞ ***This unit has three automatic timers included in its operation to help save contact tips, gas, and wire:***

Tip Saver *– Weld output shuts off if tip is shorted to work surface.*

Safety shut-off *– Weld output will shut off if no arc is detected within 3 seconds after gun trigger is depressed.*

Jog mode *– When loading a new roll of wire or if the gun trigger is accidentally pressed, gas will shut off after 1 minute and wire will shut off after 2 minutes saving wire and gas.*

1 Voltage Control

Turn control clockwise to increase voltage.

2 Wire Speed Control

Turn control clockwise to increase wire feed speed.

JOG Mode

If the trigger on either gun is held for more than 3 seconds without striking an arc, the unit will automatically shut off weld power (and shielding gas output on MIG gun only), but will feed wire continuously at the preset wire feed speed (which may be faster or slower than Run–in Speed) until trigger is released.

Run–in Wire Feed Speed Settings

Run–in settings for the MIG and Spool Guns are independently set and stored in unit memory. The settings are in percent of the welding wire feed speed preset. Both settings are adjustable from 25 to 150 percent.

MIG Gun Run–in is factory set at 100% which is recommended for most wire sizes and types.

Spool Gun Run–in is factory set at 50% which is recommended for .030 & .035 wire. A Run–in setting of 25% is recommended for .047 wire.

To **check Run–in** settings, start with the power switch OFF. Press and hold the MIG or Spool Gun Trigger while turning the power switch ON. The unit will power up with both the displays reading *888* , then the voltage display will read ––– and the wire feed display will read the preset Run–in percentage from memory for the gun selected. To return to the weld mode without making a change, simply release trigger and pull the trigger again momentarily (one second).

To **change Run–in** settings, start with the power switch OFF. Press and hold the MIG or Spool Gun Trigger while turning the power switch ON. The unit will power up with both the displays reading *888* , then the voltage display will read ––– and the wire feed display will read the preset Run–in percentage from memory for the gun selected. To change the Run–in value, release the trigger and turn the wire feed control knob (or the wire feed adjustment knob located on the bottom handle of the spool gun) to the desired setting for the selected gun. To return to weld mode after the Run–in speed change, pull the trigger momentarily (one second).

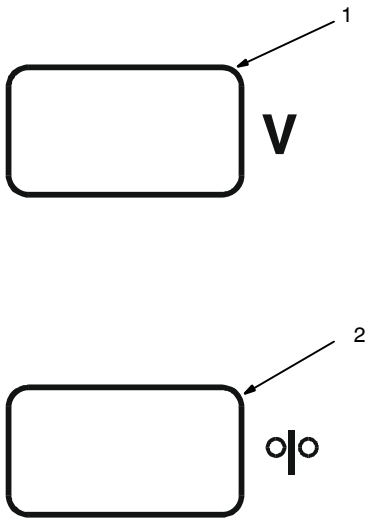
3 Power Switch

4 Voltmeter

5 Wire Feed Speed Meter

Ref. 205 637

5-2. Voltmeter And Wire Feed Speed Meter Operation



1 Voltmeter

2 Wire Feed Speed Meter

Power Up Status

Both meters display *888* at unit power up. After one second, preset values appear on both meters. The MIG gun settings (not spool gun) are always the default at initial power up of the unit. If the power is reset to quickly, characters other than *888* may appear. To reset, turn power off for at least 3 seconds, then turn power back on.

Welding Status

When either a MIG gun or spool gun trigger is pressed and a welding arc is established, the voltmeter displays actual weld voltage. When the gun trigger is released and welding arc extinguished, the voltmeter displays the last actual voltage for 5 seconds and then returns to preset voltage.

If welding resumes before unit displays preset voltage, actual welding voltage will appear on the voltmeter.

The wire feed speed meter always displays preset wire feed speed (IPM).

Gun Selection

The wire feed speed meter will display preset wire feed speed (IPM) for the appropriate gun selection either MIG or spool gun. To preset desired wire feed speed, connect desired gun, press gun trigger for one second, and release trigger. The meter preset will be retained by the meter board until a different gun is connected and preset is performed or the unit is turned off and back on. The MIG gun settings (not spool gun) are always the default at initial power up of the unit.

Error Messages

Volt Meter Display (HL.P)

Wire Feed Speed Display (001)

HL.P 001 – Communication Lost between Control Board PC1 and Display Board PC2

HL.P 002 – Unit over temperature, unit is inoperative until temperature is reduced inside unit (see Section 6-2)

HL.P 003 – No Open Circuit Voltage (OCV) detected when either trigger is pulled

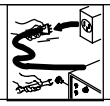
HL.P 004 – Gun trigger was engaged for approximately 2 minutes with no arc detected, or weld wire is stuck causing a direct short. If HL.P 004 occurs during power up, see Section 6-8.

HL.P 005 – Wire feed malfunction. Check wire feed delivery system (see Section 6-8).

See Section 6-8 for additional information on all HL.P codes.

SECTION 6 – MAINTENANCE &TROUBLESHOOTING

6-1. Routine Maintenance

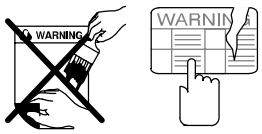


▲ **Disconnect power before maintaining.**

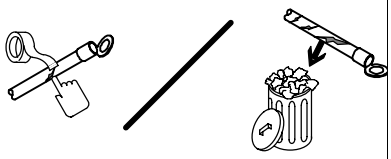
☞ *Maintain more often during severe conditions.*

3 Months

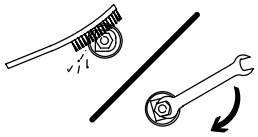
Replace unreadable labels



Repair or replace cracked weld cable

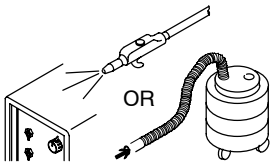


Clean and tighten weld terminals

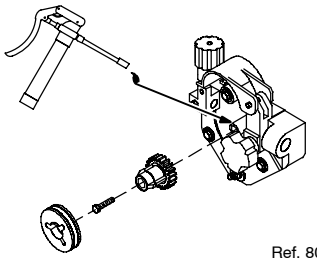


6 Months

Blow out or vacuum inside.



Remove drive roll and carrier. Apply light coat of oil or grease to drive motor shaft.

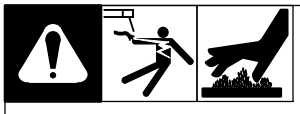


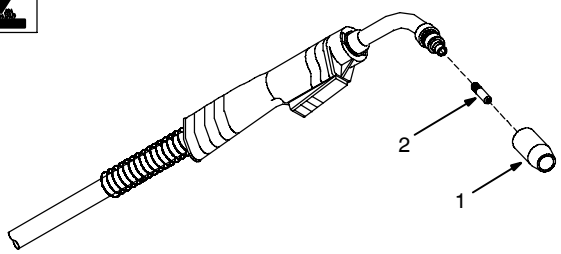
Ref. 802 990

6-2. Unit Overload

Thermistor T in SCR1 protects the unit from damage due to overheating. If HL.P 002 is displayed on the meters, wait for unit to cool allowing fan motor to run before trying to weld. If unit is cool and no weld output continues, contact Factory Authorized Service Agent.

6-3. Replacing Gun Contact Tip





▲ **Turn Off power.**

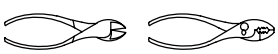
1 Nozzle

2 Contact Tip

Cut off welding wire at contact tip. Remove nozzle.

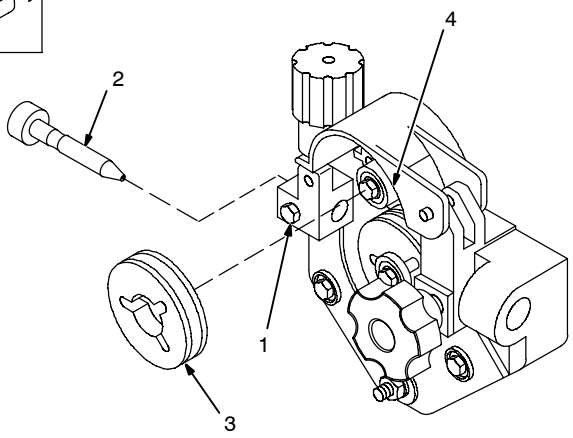
Remove contact tip and install new contact tip. Reinstall nozzle.

Tools Needed:



Ref. 800 797-C

6-4. Changing Drive Roll and Wire Inlet Guide



1 Securing Screw

2 Inlet Wire Guide

Loosen screw. Slide tip as close to drive rolls as possible without touching. Tighten screw.

3 Drive Roll

The drive roll consists of two different sized grooves. The stamped markings on the end surface of the drive roll refers to the groove on the opposite side of the drive roll. The groove closest to the motor shaft is the proper groove to thread (see Section 4-15).

4 Drive Roll Securing Nut

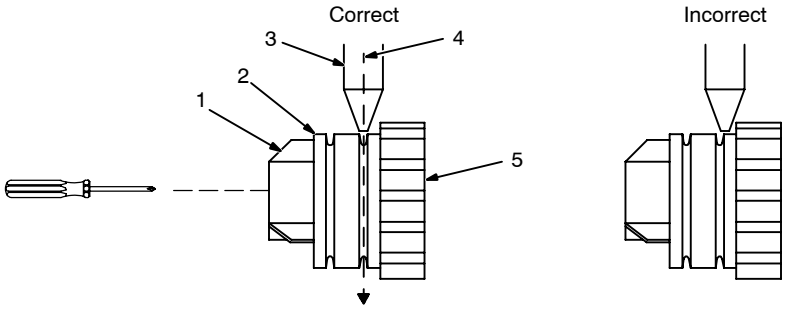
Turn nut one click to secure drive roll.

Tools Needed:

7/16 in

Ref. 802 990-A

6-5. Aligning Drive Rolls and Wire Guide



▲ **Turn Off power.**

View is from top of drive rolls looking down with pressure assembly open.

1 Drive Roll Securing Nut

2 Drive Roll

3 Wire Guide

4 Welding Wire

5 Drive Gear

Insert screwdriver, and turn screw in or out until drive roll groove lines up with wire guide.

Close pressure roll assembly.

Tools Needed:

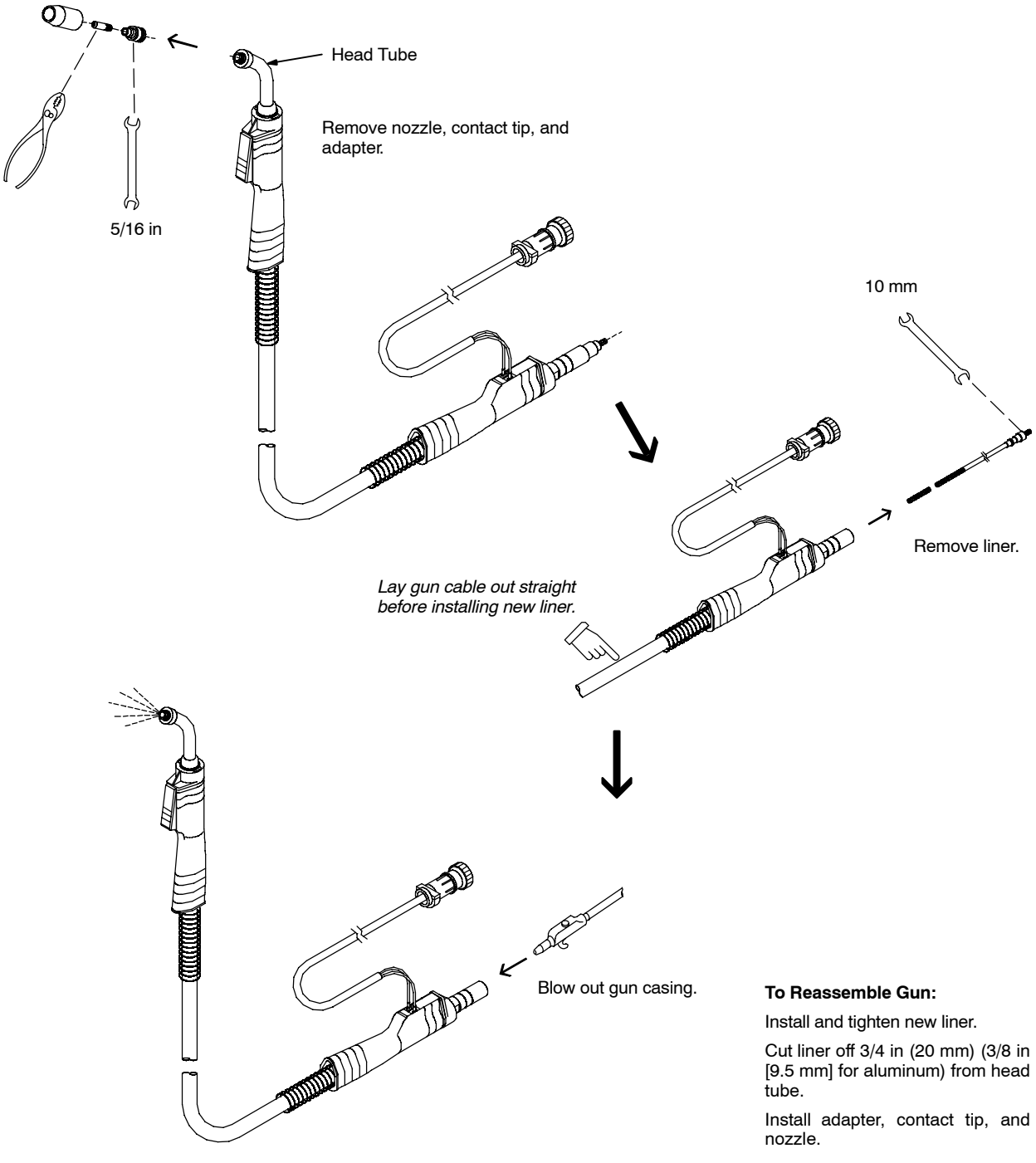
Ref. 800 412-A

6-6. Cleaning Or Replacing Gun Liner

▲ **Disconnect gun from unit first.**

Tools Needed:

5/16 in, 10 mm



To Reassemble Gun:

Install and tighten new liner.

Cut liner off 3/4 in (20 mm) (3/8 in [9.5 mm] for aluminum) from head tube.

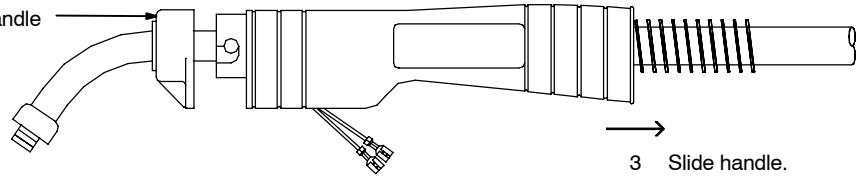
Install adapter, contact tip, and nozzle.

Ref. 800 797-C

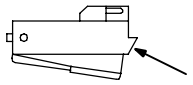
6-7. Replacing Switch And/Or Head Tube

▲ **Disconnect gun first.**

1 Remove handle locking nut.

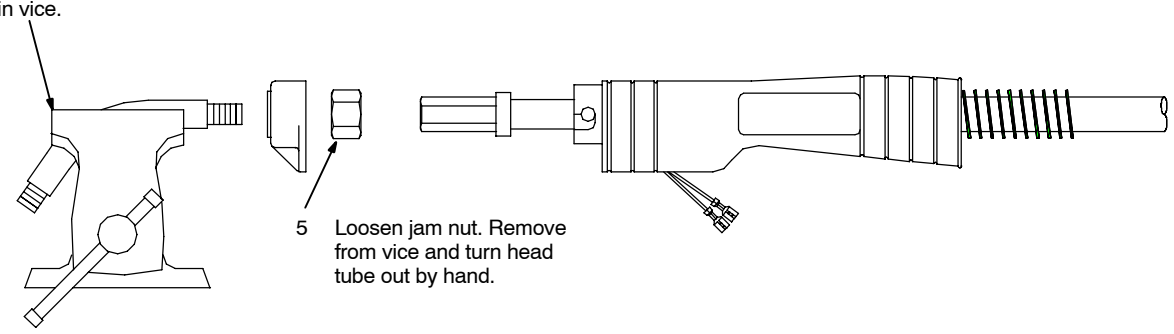


3 Slide handle.



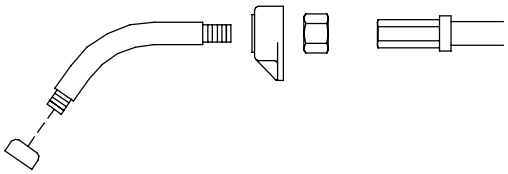
2 Remove switch housing. Note**:** If installing new switch, push switch lead connectors onto terminal of new switch (polarity is not important). Install switch back into handle, and secure with handle locking nut. If replacing head tube, continue to end of figure.

4 Secure head tube in vice.

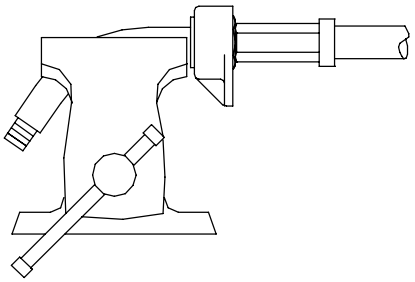


5 Loosen jam nut. Remove from vice and turn head tube out by hand.

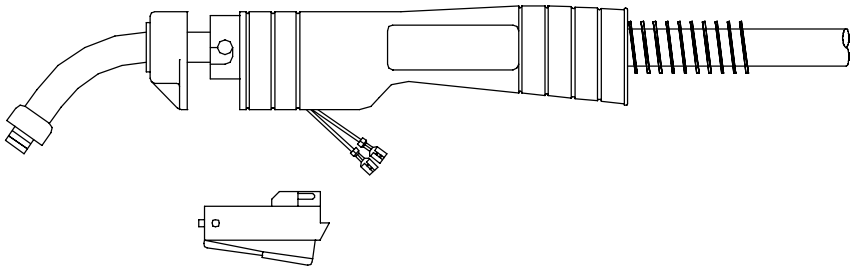
6 Install existing shock washer onto new head tube. Hand-tighten head tube into connector cable.



7 Place head tube in vice and tighten until nuts are tight.



8 Remove from vice. Reposition handle and install switch housing. Secure with handle locking nut.

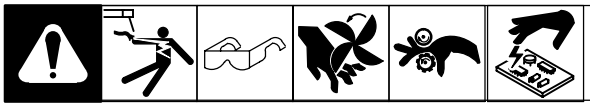


Tools Needed:

3/4 in

Ref. 800 795-C

6-8. Troubleshooting



Trouble	Remedy
No weld output; wire does not feed.	Be sure line disconnect switch is On (see Section 4-14).
	Replace building line fuse or reset circuit breaker if open (see Section 4-14).
	Secure gun trigger connections (see Section 4-7).
	HL.P 001 appears on meters. Turn power switch off and back on, if HL.P 001 appears on meters again, have Factory Authorized Service Agent check unit.
	HL.P 002 appears on meters. Thermistor T is detecting an overheating condition. Wait for unit to cool allowing the fan to run. After unit is cool, if HL.P 002 message remains, have Factory Authorized Service Agent check for an open Thermistor T (see Section 6-2).
	HL.P 004 appears on meters. Reset message by releasing the trigger or removing stuck wire causing short circuit (see Section 5-2) . If message remains, have Factory Authorized Service Agent check for shorted trigger leads.
	Have Factory Authorized Service Agent check Power switch.
	Have Factory Authorized Service Agent check all board connections and main control board.
No Weld Output; wire feeds.	Connect work clamp to get good metal to metal contact.
	Replace contact tip (see Section 6-3).
	HL.P 003 appears on meters, have Factory Authorized Service Agent check main control board and main rectifier.
Low weld output.	Connect unit to proper input voltage or check for low line voltage (see Section 4-14).
	Check input voltage jumper links and correct position if necessary (see Section 4-12).
	Have Factory Authorized Service Agent check main control board.
Fan motor does not run.	Have Factory Authorized Service Agent check fan-on-demand circuit.
Low, high, or erratic wire speed.	Readjust front panel settings (see Section 5-1).
	Change to correct size drive rolls (see Section 6-4).
	Readjust drive roll pressure (see Section 4-15).
	Replace inlet guide, contact tip, and/or liner if necessary (see Sections 6-3, and 6-6).
	Check position of input jumper links (see Section 4-12).
	Have Factory Authorized Service Agent check main control board.

Trouble	Remedy
No wire feed.	Turn Wire Speed control to higher setting (see Section 5-1).
	Clear obstruction in gun contact tip or liner (see Sections 6-3, and 6-6).
	Readjust drive roll pressure (see Section 4-15).
	Change to correct size drive rolls (see Section 6-4).
	Rethread welding wire (see Section 4-15).
	HL.P 002 appears on meters. Thermistor T is detecting an overheating condition. Wait for unit to cool allowing the fan to run. After unit is cool, If HL.P 002 message remains, contact Factory Authorized Service Agent (see Section 6-2).
	HL.P 004 appears on meters. Reset message by releasing the trigger or removing stuck wire causing short circuit (see Section 5-2) . If message remains, have Factory Authorized Service Agent check for shorted trigger leads.
	HL.P 005 appears on meters. Wire feed malfunction. Check wire feed delivery system.
	Check gun trigger and leads. Repair or replace gun if necessary.
	Have Factory Authorized Service Agent check main control board.

SECTION 7 – ELECTRICAL DIAGRAM

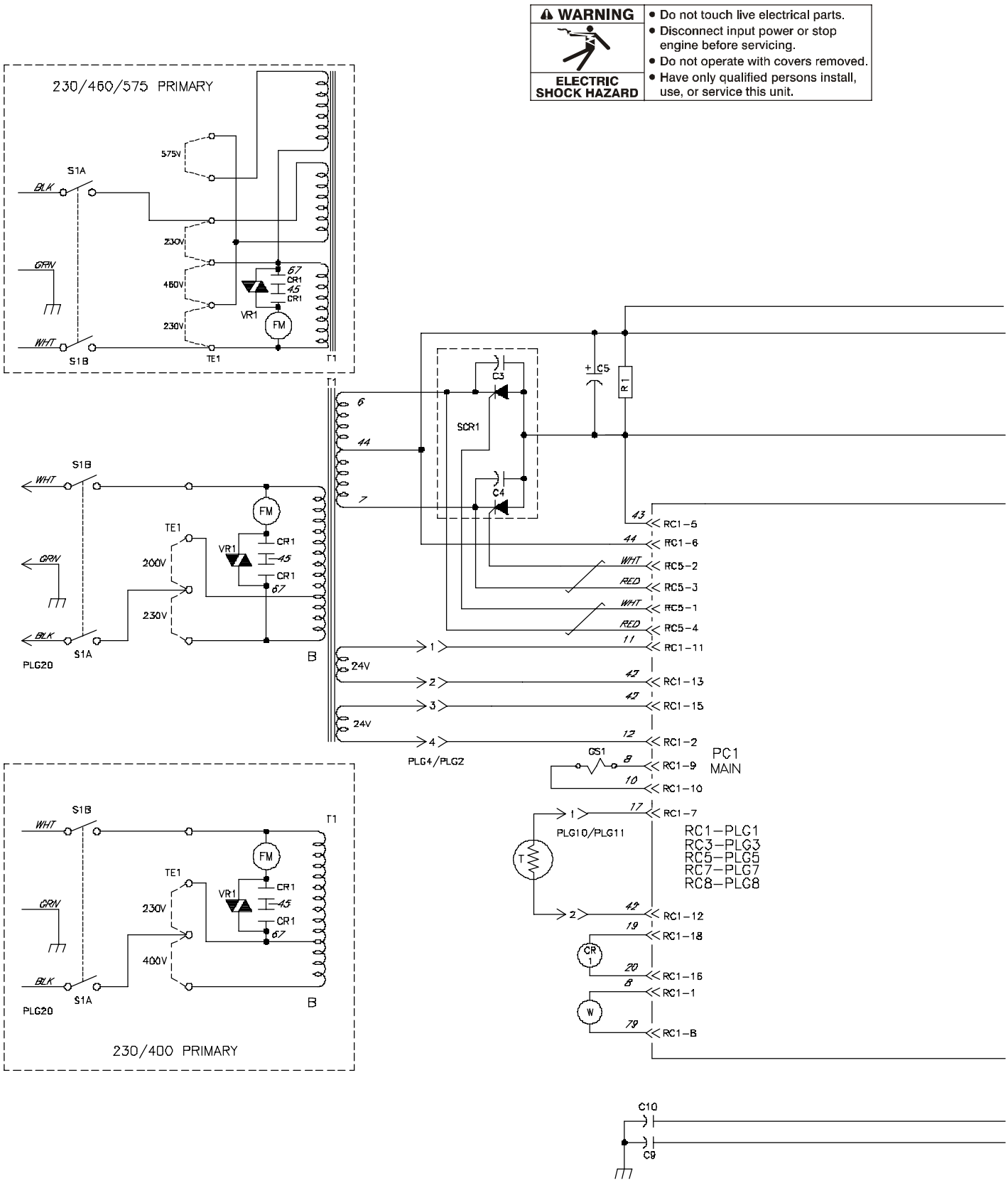
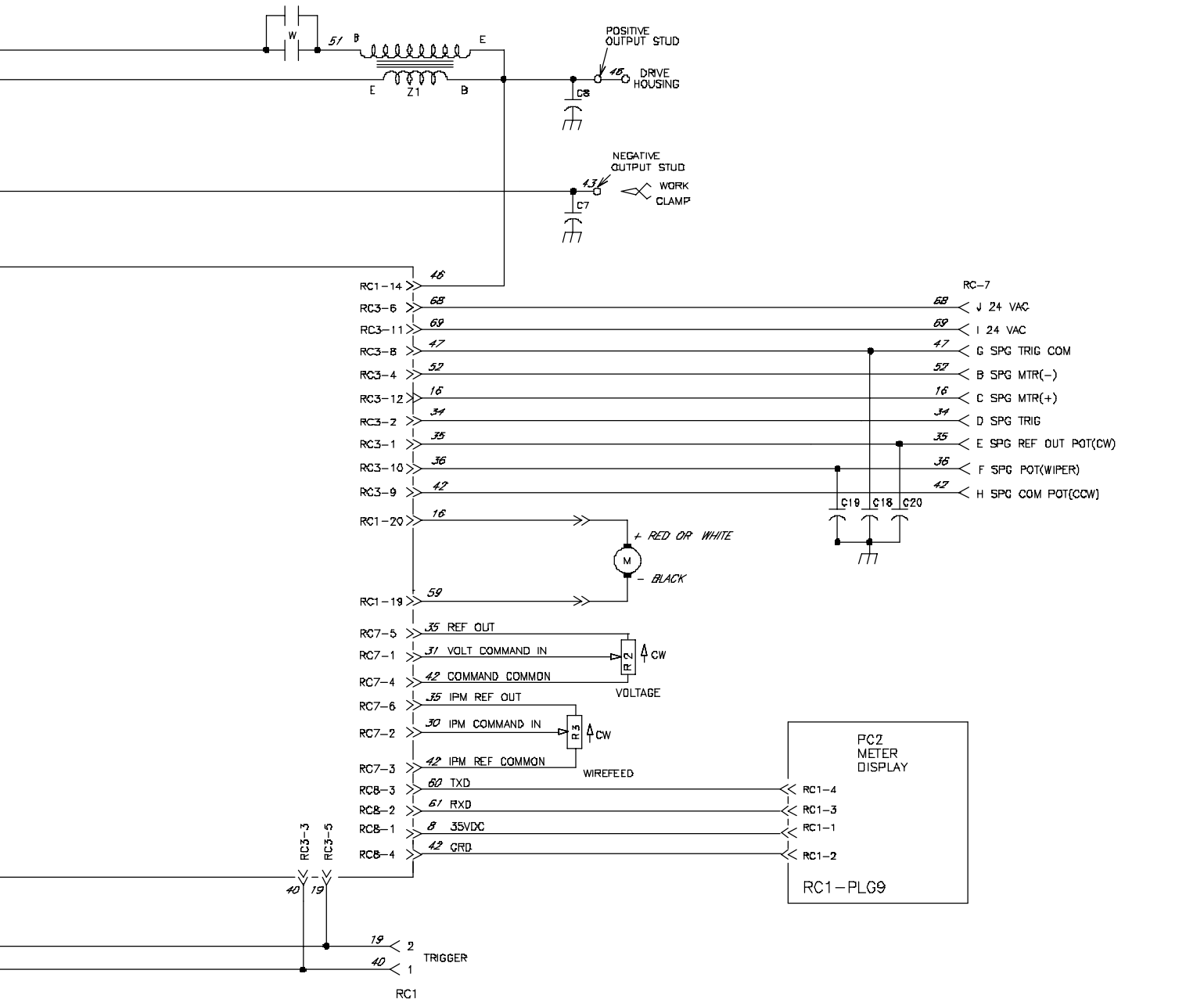


Figure 7-1. Circuit Diagram

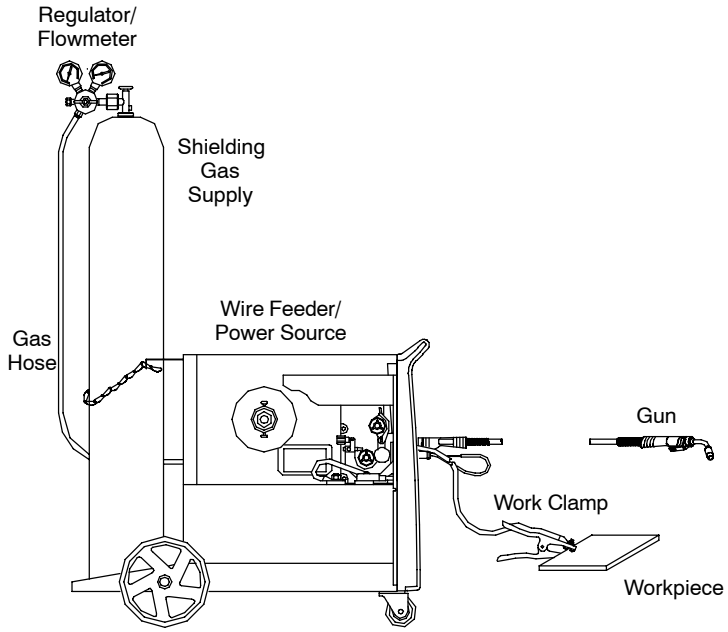

W
51
B
E
E
Z1
B
POSITIVE OUTPUT STUD
46
DRIVE HOUSING
C8
NEGATIVE OUTPUT STUD
43
WORK CLAMP
C7
RC1-14
48
RC3-6
68
RC3-11
69
RC3-8
47
RC3-4
57
RC3-12
16
RC3-2
34
RC3-1
35
RC3-10
36
RC3-9
42
RC1-20
16
+ RED OR WHITE
M
- BLACK
RC1-19
59
RC7-5
35 REF OUT
RC7-1
31 VOLT COMMAND IN
R2
CW
RC7-4
42 COMMAND COMMON
VOLTAGE
RC7-6
35 IPM REF OUT
RC7-2
30 IPM COMMAND IN
R3
CW
RC7-3
42 IPM REF COMMON
WIREFEED
RC8-3
60 TXD
RC8-2
61 RXD
RC8-1
8 35VDC
RC8-4
42 GRD
RC3-3
RC3-5
40
19
19
2
40
1
TRIGGER
RC1
RC-7
68 J 24 VAC
69 I 24 VAC
47 G SPG TRIG COM
57 B SPG MTR(-)
16 C SPG MTR(+)
34 D SPG TRIG
35 E SPG REF OUT POT(CW)
36 F SPG POT(WIPER)
42 H SPG COM POT(CCW)
C19
C18
C20
PC2
METER
DISPLAY
RC1-4
RC1-3
RC1-1
RC1-2
RC1-PLG9

211 406-C

SECTION 8 – MIG WELDING (GMAW) GUIDELINES

8-1. Typical MIG Process Connections

▲ **Weld current can damage electronic parts in vehicles. Disconnect both battery cables before welding on a vehicle. Place work clamp as close to the weld as possible.**

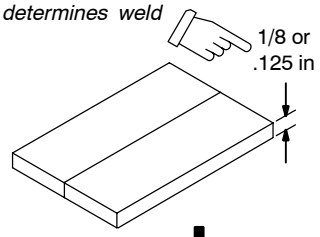


light mig 11/03 / Ref. 802 064-D

8-2. Typical MIG Process Control Settings

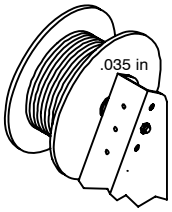
NOTE ☞ *These settings are guidelines only. Material and wire type, joint design, fitup, position, shielding gas, etc. affect settings. Test welds to be sure they comply to specifications.*

Material thickness determines weld parameters.



Convert Material Thickness to Amperage (A)

(.001 in = 1 ampere)
.125 in = 125 A



Wire Size	Amperage Range
.023 in	30 – 90 A
.030 in	40 – 145 A
.035 in	50 – 180 A

Select Wire Size

Wire Size	Recommendation	Wire Speed (Approx.)
.023 in	3.5 in per ampere	3.5 x 125 A = 437 ipm
.030 in	2 in per ampere	2 x 125 A = 250 ipm
.035 in	1.6 in per ampere	1.6 x 125 A = 200 ipm

Select Wire Speed (Amperage)

125 A based on 1/8 in material thickness

ipm = inch per minute

Low voltage: wire stubs into work

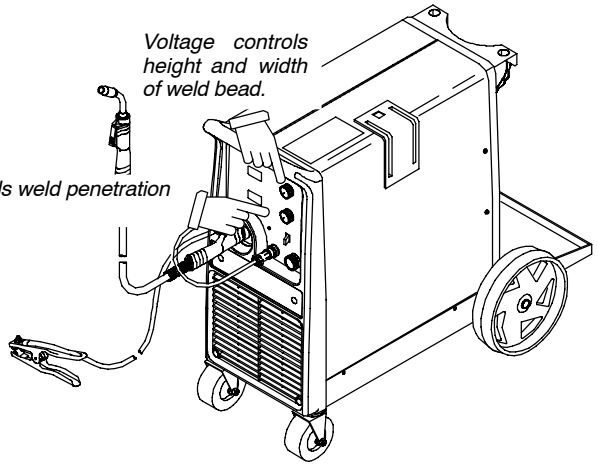
High voltage: arc is unstable (spatter)

Set voltage midway between high/low voltage.

Select Voltage

Voltage controls height and width of weld bead.

Wire speed (amperage) controls weld penetration (wire speed = burn-off rate)

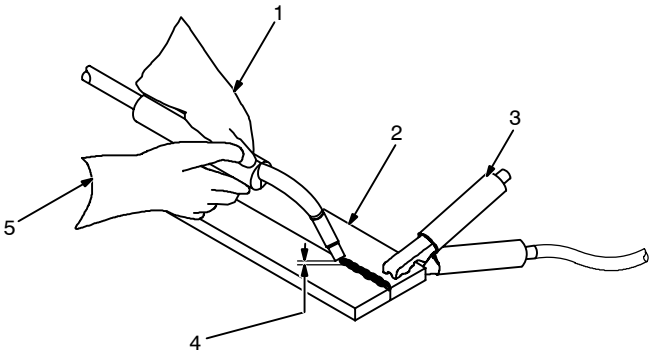


Ref. 802 473-B

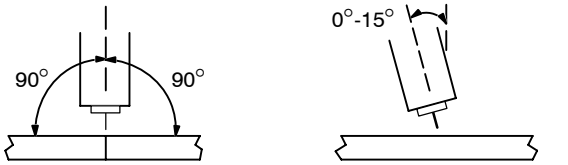
8-3. Holding And Positioning Welding Gun

NOTE ☞

Welding wire is energized when gun trigger is pressed. Before lowering helmet and pressing trigger, be sure wire is no more than 1/2 in (13 mm) past end of nozzle, and tip of wire is positioned correctly on seam.

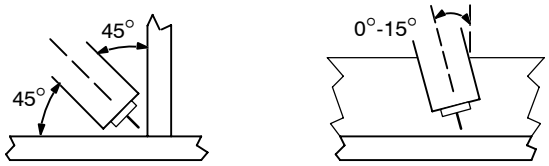


1 Hold Gun and Control Gun Trigger
2 Workpiece
3 Work Clamp
4 Electrode Extension (Stickout) 1/4 to 1/2 in (6 To 13 mm)
5 Cradle Gun and Rest Hand on Workpiece



End View Of Work Angle — Side View Of Gun Angle

GROOVE WELDS



End View Of Work Angle — Side View Of Gun Angle

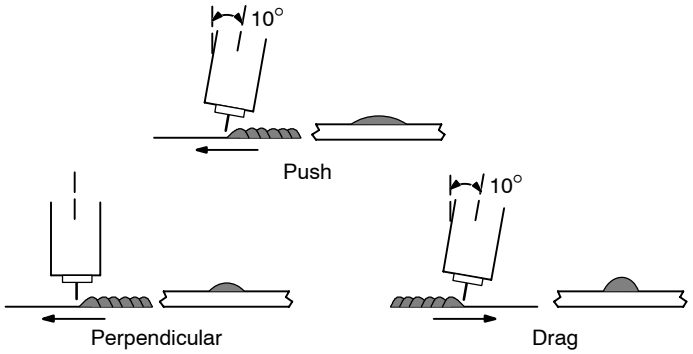
FILLET WELDS

S-0421-A

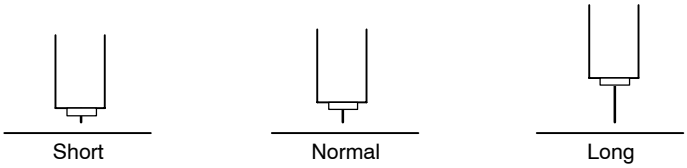
8-4. Conditions That Affect Weld Bead Shape

NOTE ☞

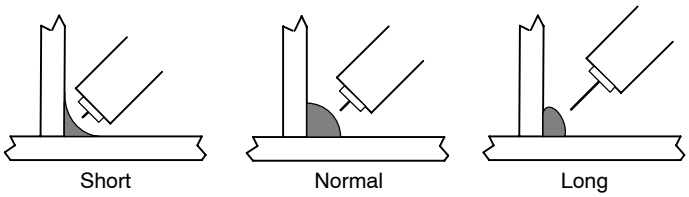
Weld bead shape depends on gun angle, direction of travel, electrode extension (stickout), travel speed, thickness of base metal, wire feed speed (weld current), and voltage.



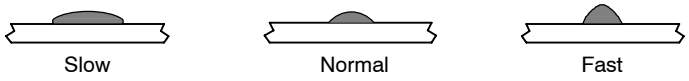
GUN ANGLES AND WELD BEAD PROFILES



ELECTRODE EXTENSIONS (STICKOUT)



FILLET WELD ELECTRODE EXTENSIONS (STICKOUT)



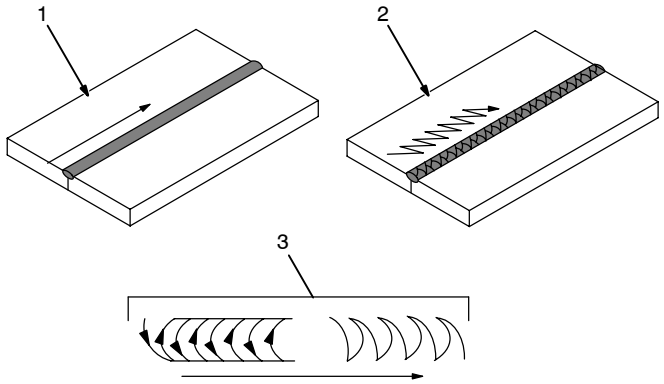
GUN TRAVEL SPEED

S-0634

8-5. Gun Movement During Welding

NOTE ☞

Normally, a single stringer bead is satisfactory for most narrow groove weld joints; however, for wide groove weld joints or bridging across gaps, a weave bead or multiple stringer beads works better.



1 Stringer Bead – Steady Movement Along Seam

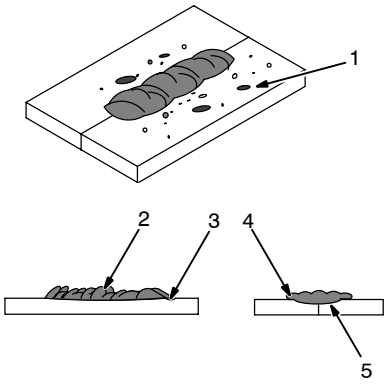
2 Weave Bead – Side To Side Movement Along Seam

3 Weave Patterns

Use weave patterns to cover a wide area in one pass of the electrode.

S-0054-A

8-6. Poor Weld Bead Characteristics



1 Large Spatter Deposits

2 Rough, Uneven Bead

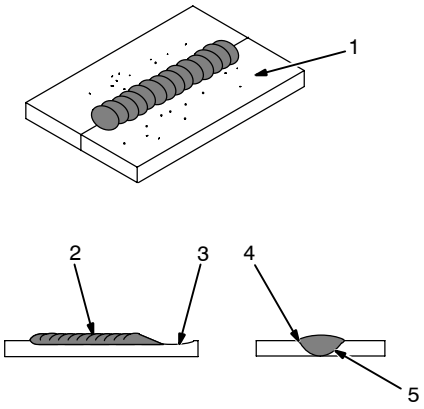
3 Slight Crater During Welding

4 Bad Overlap

5 Poor Penetration

S-0053-A

8-7. Good Weld Bead Characteristics



1 Fine Spatter

2 Uniform Bead

3 Moderate Crater During Welding

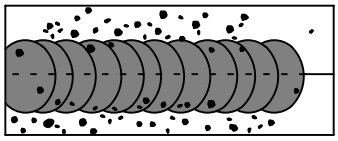
Weld a new bead or layer for each 1/8 in (3.2 mm) thickness in metals being welded.

4 No Overlap

5 Good Penetration into Base Metal

S-0052-B

8-8. Troubleshooting – Excessive Spatter

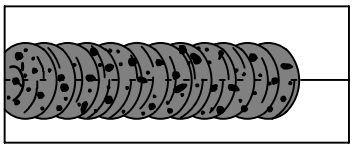


Excessive Spatter – scattering of molten metal particles that cool to solid form near weld bead.

S-0636

Possible Causes	Corrective Actions
Wire feed speed too high.	Select lower wire feed speed.
Voltage too high.	Select lower voltage range.
Electrode extension (stickout) too long.	Use shorter electrode extension (stickout).
Workpiece dirty.	Remove all grease, oil, moisture, rust, paint, undercoating, and dirt from work surface before welding.
Insufficient shielding gas at welding arc.	Increase flow of shielding gas at regulator/flowmeter and/or prevent drafts near welding arc.
Dirty welding wire.	Use clean, dry welding wire.
	Eliminate pickup of oil or lubricant on welding wire from feeder or liner.

8-9. Troubleshooting – Porosity

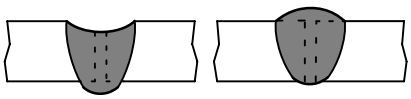


Porosity – small cavities or holes resulting from gas pockets in weld metal.

S-0635

Possible Causes	Corrective Actions
Insufficient shielding gas at welding arc.	Increase flow of shielding gas at regulator/flowmeter and/or prevent drafts near welding arc.
	Remove spatter from gun nozzle.
	Check gas hoses for leaks.
	Place nozzle 1/4 to 1/2 in (6-13 mm) from workpiece.
	Hold gun near bead at end of weld until molten metal solidifies.
Wrong gas.	Use welding grade shielding gas; change to different gas.
Dirty welding wire.	Use clean, dry welding wire.
	Eliminate pick up of oil or lubricant on welding wire from feeder or liner.
Workpiece dirty.	Remove all grease, oil, moisture, rust, paint, coatings, and dirt from work surface before welding.
	Use a more highly deoxidizing welding wire (contact supplier).
Welding wire extends too far out of nozzle.	Be sure welding wire extends not more than 1/2 in (13 mm) beyond nozzle.

8-10. Troubleshooting – Excessive Penetration



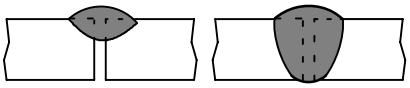
Excessive Penetration Good Penetration

Excessive Penetration – weld metal melting through base metal and hanging underneath weld.

S-0639

Possible Causes	Corrective Actions
Excessive heat input.	Select lower voltage range and reduce wire feed speed.
	Increase travel speed.

8-11. Troubleshooting – Lack Of Penetration

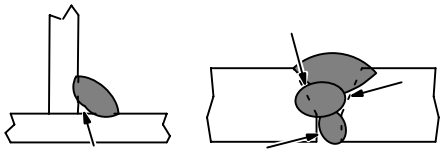


Lack Of Penetration – shallow fusion between weld metal and base metal.

S-0638

Possible Causes	Corrective Actions
Improper joint preparation.	Material too thick. Joint preparation and design must provide access to bottom of groove while maintaining proper welding wire extension and arc characteristics.
Improper weld technique.	Maintain normal gun angle of 0 to 15 degrees to achieve maximum penetration.
	Keep arc on leading edge of weld puddle.
	Be sure welding wire extends not more than 1/2 in (13 mm) beyond nozzle.
Insufficient heat input.	Select higher wire feed speed and/or select higher voltage range.
	Reduce travel speed.

8-12. Troubleshooting – Incomplete Fusion

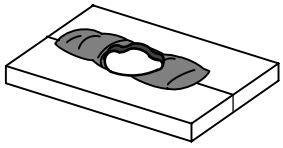


Incomplete Fusion – failure of weld metal to fuse completely with base metal or a preceeding weld bead.

S-0637

Possible Causes	Corrective Actions
Workpiece dirty.	Remove all grease, oil, moisture, rust, paint, undercoating, and dirt from work surface before welding.
Insufficient heat input.	Select higher voltage range and/or adjust wire feed speed.
Improper welding technique.	Place stringer bead in proper location(s) at joint during welding.
	Adjust work angle or widen groove to access bottom during welding.
	Momentarily hold arc on groove side walls when using weaving technique.
	Keep arc on leading edge of weld puddle.
	Use correct gun angle of 0 to 15 degrees.

8-13. Troubleshooting – Burn-Through

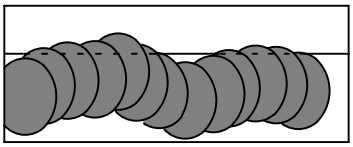


Burn-Through – weld metal melting completely through base metal resulting in holes where no metal remains.

S-0640

Possible Causes	Corrective Actions
Excessive heat input.	Select lower voltage range and reduce wire feed speed.
	Increase and/or maintain steady travel speed.

8-14. Troubleshooting – Waviness Of Bead

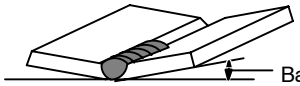


Waviness Of Bead – weld metal that is not parallel and does not cover joint formed by base metal.

S-0641

Possible Causes	Corrective Actions
Welding wire extends too far out of nozzle.	Be sure welding wire extends not more than 1/2 in (13 mm) beyond nozzle.
Unsteady hand.	Support hand on solid surface or use two hands.

8-15. Troubleshooting – Distortion



Distortion – contraction of weld metal during welding that forces base metal to move.

S-0642

Possible Causes	Corrective Actions
Excessive heat input.	Use restraint (clamp) to hold base metal in position.
	Make tack welds along joint before starting welding operation.
	Select lower voltage range and/or reduce wire feed speed.
	Increase travel speed.
	Weld in small segments and allow cooling between welds.

8-16. Common MIG Shielding Gases

This is a general chart for common gases and where they are used. Many different combinations (mixtures) of shielding gases have been developed over the years. The most commonly used shielding gases are listed in the following table.

Gas	Application			
	Spray Arc Steel	Short Circuiting Steel	Short Circuiting Stainless Steel	Aluminum
Argon				X
Argon + 25% CO_2		X		
80% or greater Argon + balance CO_2 or Oxygen	X	X[1]		
100% CO_2		X		
Tri-Mix[2]			X	

1 Limited short circuiting use

2 90% HE + 7-1/2% AR + 2-1/2% CO_2

8-17. Troubleshooting Guide For Semiautomatic Welding Equipment

Problem	Probable Cause	Remedy
Wire feed motor operates, but wire does not feed.	Too little pressure on wire feed rolls.	Increase pressure setting on wire feed rolls.
	Incorrect wire feed rolls.	Check size stamped on wire feed rolls, replace to match wire size and type if necessary.
	Wire spool brake pressure too high.	Decrease brake pressure on wire spool.
	Restriction in the gun and/or assembly.	Check and replace cable, gun, and contact tip if damaged. Check size of contact tip and cable liner, replace if necessary.
Wire curling up in front of the wire feed rolls (bird nesting).	Too much pressure on wire feed rolls.	Decrease pressure setting on wire feed rolls.
	Incorrect cable liner or gun contact tip size.	Check size of contact tip and check cable liner length and diameter, replace if necessary.
	Gun end not inserted into drive housing properly.	Loosen gun securing bolt in drive housing and push gun end into housing just enough so it does not touch wire feed rolls.
	Dirty or damaged (kinked) liner.	Replace liner.
Wire feeds, but no gas flows.	Gas cylinder empty.	Replace empty gas cylinder.
	Gas nozzle plugged.	Clean or replace gas nozzle.
	Gas cylinder valve not open or flowmeter not adjusted.	Open gas valve at cylinder and adjust flow rate.
	Restriction in gas line.	Check gas hose between flowmeter and wire feeder, and gas hose in gun and cable assembly.
	Loose or broken wires to gas solenoid.	Have Factory Authorized Service Agent repair wiring.
	Gas solenoid valve not operating.	Have Factory Authorized Service Agent replace gas solenoid valve.
	Incorrect primary voltage connected to welding power source.	Check primary voltage and relink welding power source for correct voltage.

Problem	Probable Cause	Remedy
Welding arc not stable.	Wire slipping in drive rolls.	Adjust pressure setting on wire feed rolls. Replace worn drive rolls if necessary.
	Wrong size gun liner or contact tip.	Match liner and contact tip to wire size and type.
	Incorrect voltage setting for selected wire feed speed on welding power source.	Readjust welding parameters.
	Loose connections at the gun weld cable or work cable.	Check and tighten all connections.
	Gun in poor shape or loose connection inside gun.	Repair or replace gun as necessary.

☞ *Hardware is common and not available unless listed.*

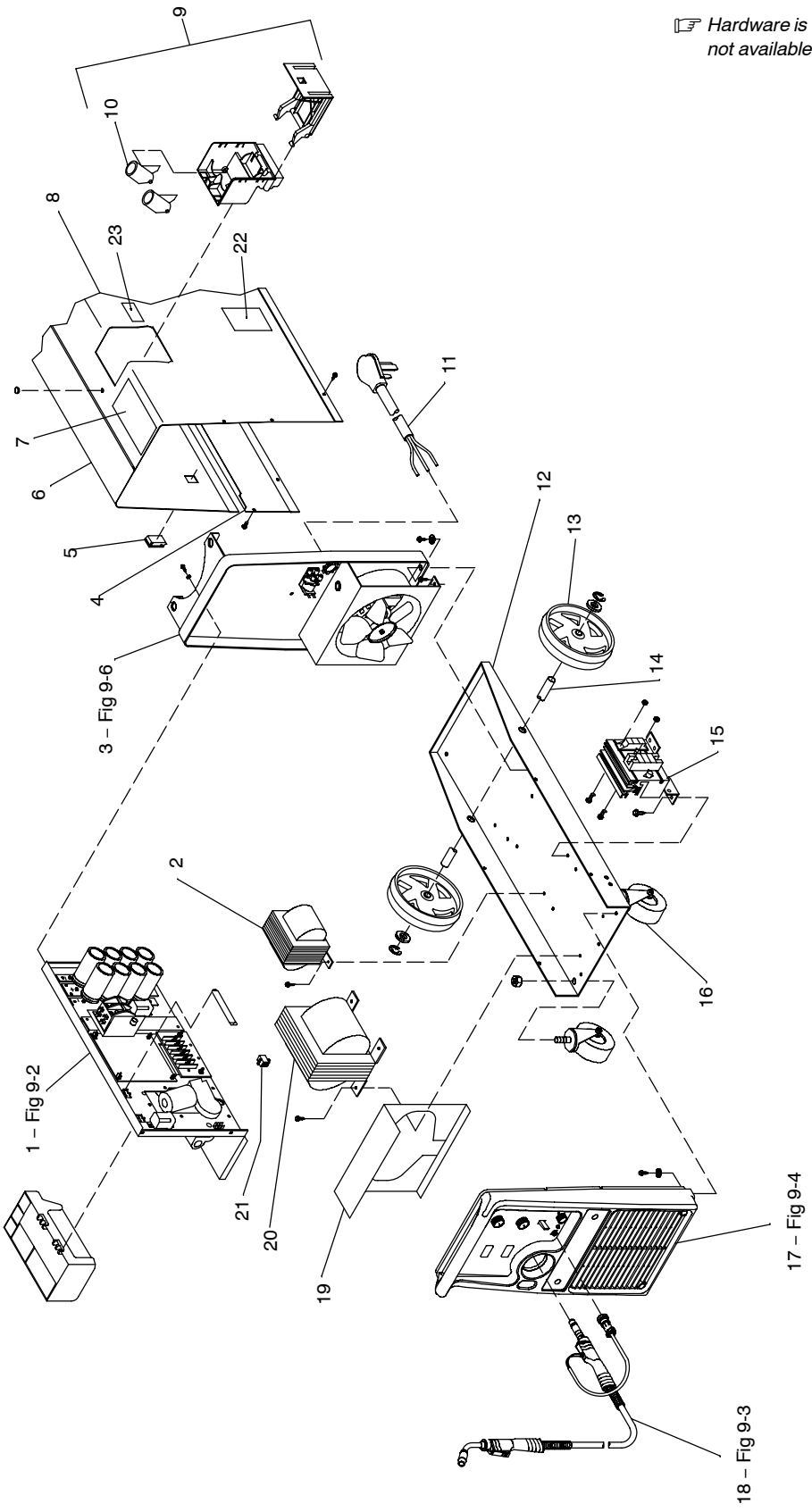


Figure 9-1. Main Assembly

Item No.	Dia. Mkgs.	Part No.	Description	Quantity

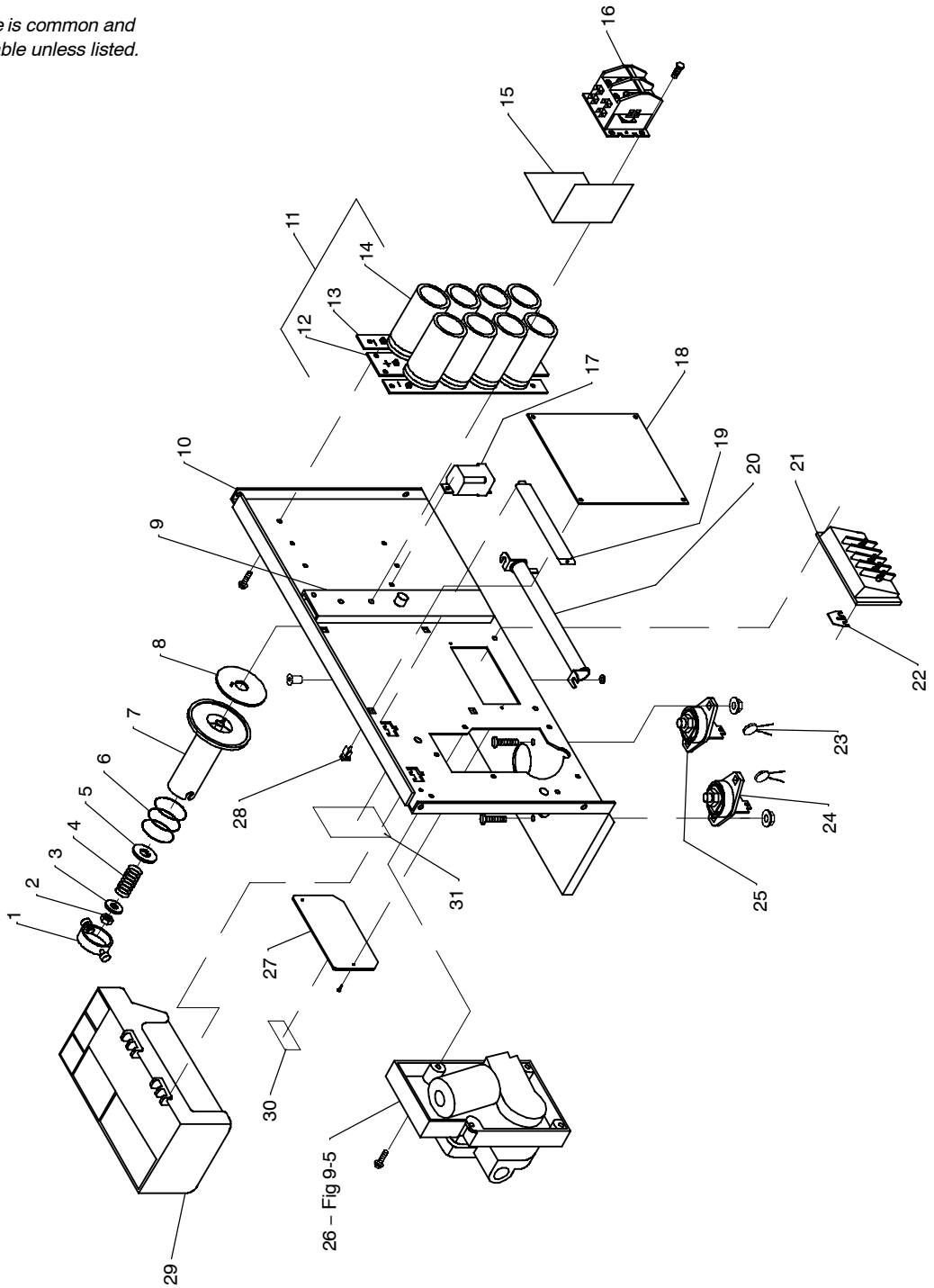
Figure 9-1. Main Assembly

1		Fig 9-2	BAFFLE, center w/components	1
2	Z1	222 476	STABILIZER	1
3		Fig 9-6	PANEL, rear w/components	1
4		203 481	PANEL, side LH	1
5		151 187	LATCH, slide flush mtg hole 1.000 wide x 1.500 lg	2
6		203 480	DOOR, hinged	1
		201 202	LABEL, parameter	1
7		134 464	LABEL, warning general precautionary	2
8		+203 482	WRAPPER	1
9		200 923	GUN/CABLE HOLDER, (consisting of)	1
10		200 921	HOLSTER, gun/cable holder	2
11		188 911	CABLE, pwr 250v 6-50p 8-10ga 3/c 12ft for 200/230	1
11		187 255	CABLE, pwr 250v t tng 8-10ga 3/c 12ft for 230/460/575 or 230/400	1
		199 823	LABEL, warning electric shock power cord	1
12		146 161	BASE	1
13		186 758	WHEEL	2
14		052 692	AXLE, running gear (consisting of)	1
		121 614	RING, retaining ext .750 shaft x .085grv depth	2
15		200 519	RECTIFIER, SCR main (consisting of)	1
	SR1	197 698	THYRISTOR, SCR module 300A 400V common anode	1
	C3,4	031 689	CAPACITOR, rectifier	2
	T	173 632	THERMISTER, 30K @ 25C	2
		205 946	FOOT. mtg rectifier	2
	PLG5	115 094	HOUSING PLUG & SKTS (4 position)	1
16		209 870	CASTER, plstc swvl 4 in dia	2
17		Fig 9-4	PANEL, front w/components	1
18		169 596	GUN, 12ft .030-.035 wire (Ilus. 6-3)	1
19		150 387	BAFFLE, air	1
20	T1	222 474	TRANSFORMER, pwr main (200/230)	1
20	T1	222 478	TRANSFORMER, pwr main (230/460/575)	1
21	PLG2	110 760	HOUSING RECEPTACLE & SOCKETS (harness)	1
22		193 328	LABEL, warning electric shock and incorrect input	1
23		201 019	LABEL, warning electric shock excess weight	1
	PLG4	110 759	HOUSING RECEPTACLE & SOCKETS (xfmr)	1
		209 123	REGULATOR/FLOWMETER, 10-50 CFH Argon/Mixed	1
		196 328	CABLE, work 10' w/clamp and boot (consisting of)	1
		130 750	CLAMP, ground 350A	1
		600 318	CABLE, weld cop strd No. 3 (order by ft)	10ft
		196 318	COVER, cable btry post blk .75 ID	1
		144 108	HOSE, gas	1
		♦212 492	REGULATOR/FLOWMETER, 10-50 CFH CO_2	1

+When ordering a component originally displaying a precautionary label, the label should also be ordered.
♦OPTIONAL

To maintain the factory original performance of your equipment, use only Manufacturer's Suggested Replacement Parts. Model and serial number required when ordering parts from your local distributor.

☞ *Hardware is common and not available unless listed.*



803007-D

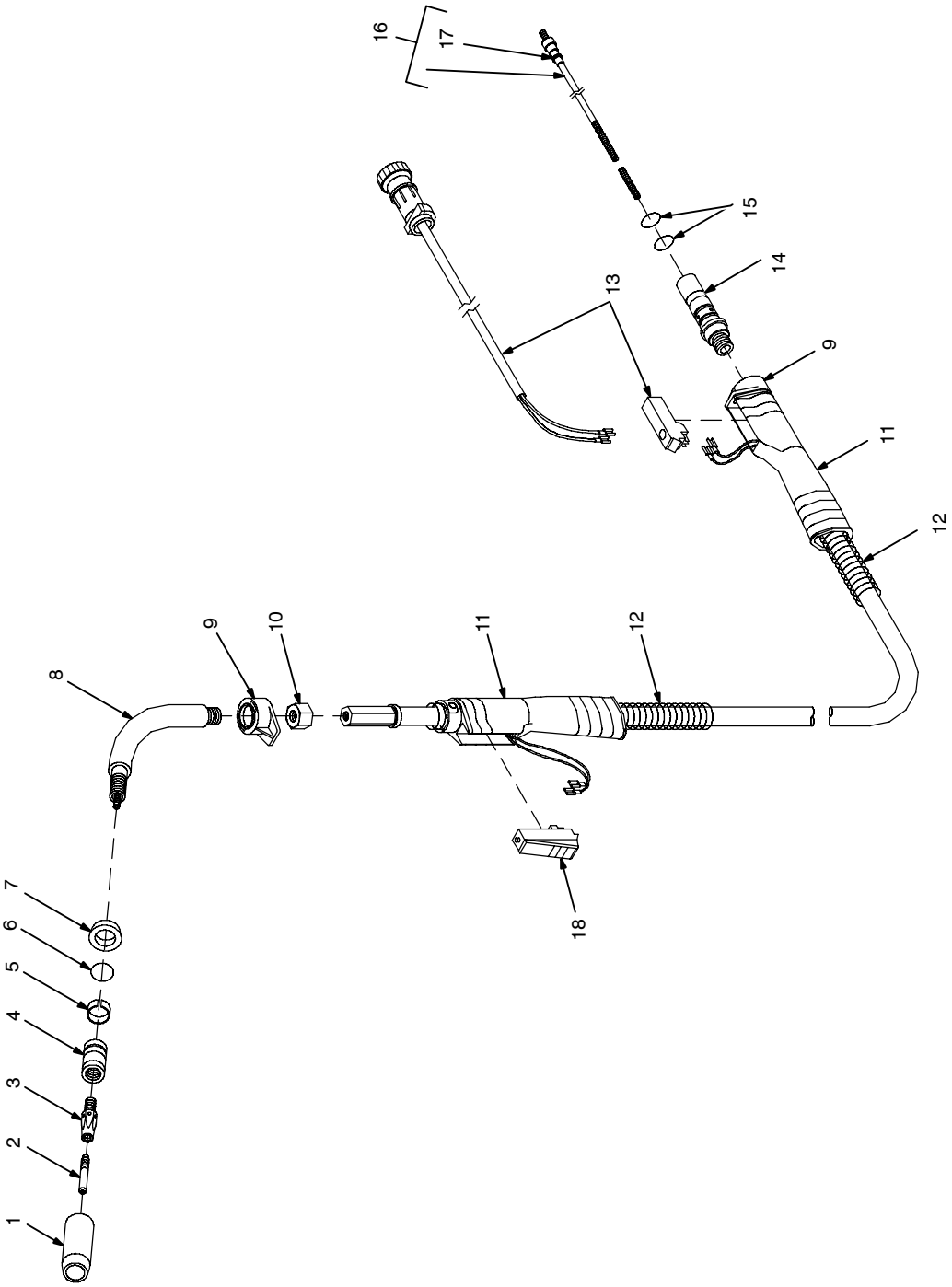
Figure 9-2. Baffle, Center w/Components

Item No.	Dia. Mkgs.	Part No.	Description	Quantity
1		058 427	RING, retaining spool	1
2		085 980	NUT, stl hex full .625-11	1
3		605 941	WASHER, flat stl .640 ID x 1.000 OD x 14ga thk	1
4		186 437	SPRING, cprsn .845 OD x .110 wire x 1.500	1
5		057 971	WASHER, flat stl keyed 1.500dia x .125thk	1
6		057 745	SPRING, cprsn 2.430 OD x .090 wire x 2.500	1
7		186 435	HUB, spool	1
8		186 436	WASHER, brake	1
9		177 307	REEL, support	1
		198425	CAP, finishing 1.19 X .37	2
		198426	WASHER, cap	2
10		211 413	BAFFLE, center	1
11		186 998	CAPACITOR ASSEMBLY KIT, (consisting of)	1
12		082 902	STRIP, mtg center capacitor	1
13		185 643	STRIP, mtg capacitors	2
		083 147	GROMMET, scr No. 8/10 panel hole .312sq .500 high	6
14	C5	184 584	CAPACITOR, elctlt 15000uf 45VDC	8
		187 752	INSULATOR, capacitor	1
15		204 318	BRACKET, mtg	1
16	W	204 319	CONTACTOR, def prp 25A 2P 36VDC	1
17	CR1	052 964	RELAY, 24V DPDT 10A/120VAC	1
	VR1	144 425	VARISTOR, w/leads	1
18	PC1	220 069	CIRCUIT CARD, control	1
	PLG1	162 382	HOUSING PLUG & SOCKETS	1
	PLG3	130 203	HOUSING RECEPTACLE & SOCKETS	1
	PLG7	115 092	HOUSING RECEPTACLE & SOCKETS	1
	PLG8	115 093	HOUSING PLUG & SOCKETS	1
19		196 894	COVER	1
20	R1	119 998	RESISTOR, WW fxd 300W 5 ohm	1
21	TE1	188 910	TERMINAL ASSEMBLY, pri 1ph double voltage (200/230 or 230/400)	1
21	TE1	192 907	TERMINAL ASSEMBLY, pri 1ph triple voltage (230/460/575)	1
22		038 618	LINK, jumper term bd pri	as req.
23	C7,8	128 750	CAPACITOR	2
24	POS	097 421	TERMINAL, pwr output red	1
25	NEG	097 416	TERMINAL, pwr output black	1
26		9-5	WIRE DRIVE & GEARS	1
27		188 917	DOOR, access changeover	1
28		134 201	STAND-OFF SUPPORT, PC card	4
29		197 555	TOOL TRAY	1
30		021 469	LABEL, warning high voltage	1
31		199 824	LABEL, warning electric shock and pinch points	1

Figure 9-2. Baffle, Center w/Components (Fig 9-1 Item 1)

+When ordering a component originally displaying a precautionary label, the label should also be ordered.

To maintain the factory original performance of your equipment, use only Manufacturer's Suggested Replacement Parts. Model and serial number required when ordering parts from your local distributor.



Ref. 800 792-C

Figure 9-3. M-25 Gun

Item No.	Dia. Mkgs.	Part No.	Description	Quantity

Figure 9-3. M-25 Gun (Fig 9-1 Item 18)

1		200 258	NOZZLE, slip type .500 orf flush	1
1	♦	169 724	NOZZLE, slip type .500 orf .125 recess	
1	♦	169 725	NOZZLE, slip type .625 orf .125 recess	
1	♦	169 726	NOZZLE, slip type .625 orf flush	
1	♦	169 727	NOZZLE, slip type .625 orf .125 stickout	
2	♦	087 299	TIP, contact scr .023 wire x 1.125	
2	♦	000 067	TIP, contact scr .030 wire x 1.125	
2	♦	000 068	TIP, contact scr .035 wire x 1.125	
2	♦	000 069	TIP, contact scr .045 wire x 1.125	
3		169 728	ADAPTER, contact tip	1
4		169 729	ADAPTER, nozzle	1
5		170 467	RING, retaining	1
6		170 468	O-RING	1
7		169 730	WASHER, shock	1
8		169 731	TUBE, head	1
9		169 738	NUT, locking handle	2
10		169 732	NUT, jam	1
11		169 737	HANDLE	2
12		169 741	STRAIN RELIEF, cable	2
13		180 433	CORD, trigger assembly	1
14		209 486	CONNECTOR, feeder	1
15		079 974	O-RING, .500 ID x .103CS rbr	2
16		194 011	LINER, monocoil .030/.035 wire x 15ft (consisting of)	1
16	♦	194 010	LINER, monocoil .023/.025 wire x 15ft (consisting of)	1
16	♦	194 012	LINER, monocoil .035/.045 wire x 15ft (consisting of)	1
17		079 975	O-RING, .187 ID x .103CS rbr	1
18		196 255	SWITCH, trigger	1

♦ OPTIONAL

To maintain the factory original performance of your equipment, use only Manufacturer's Suggested Replacement Parts. Model and serial number required when ordering parts from your local distributor.

Item No.	Dia. Mkgs.	Part No.	Description	Quantity

Figure 9-4. Panel, Front w/Components (Fig 9-1 Item 17)

1		208 357	LABEL, nameplate	1
2		209 561	CIRCUIT CARD ASSY, display	1
	PLG9	115 094	PLUG w/SOCKETS	1
3		134 201	STANDOFF	4
4		196 801	BRACKET, mtg display board	1
5	C9,10,18, 19,20	136 735	CAPACITOR, cer disc .1uf 500VDC	5
6	R2,3	208 207	POTENTIOMETER	2
	PLG7	115 092	HOUSING RECEPTACLE & SOCKETS	1
7		208 166	PANEL, front	1
8	S1	128 755	SWITCH, tgl	1
9	RC1	048 282	RECEPTACLE w/SOCKETS	1
10	RC7	190 363	RECEPTACLE w/SOCKETS	1
11		208 167	LABEL, logo	1
12		208 164	PANEL, front bezel	1
13		193 632	NUT, 375-16 .56 hex .34H stl	2
14		207 077	KNOB, pointer 1.625dia	2
15		129 524	TERM, frict 250 x 032	1

☞ *Hardware is common and not available unless listed.*

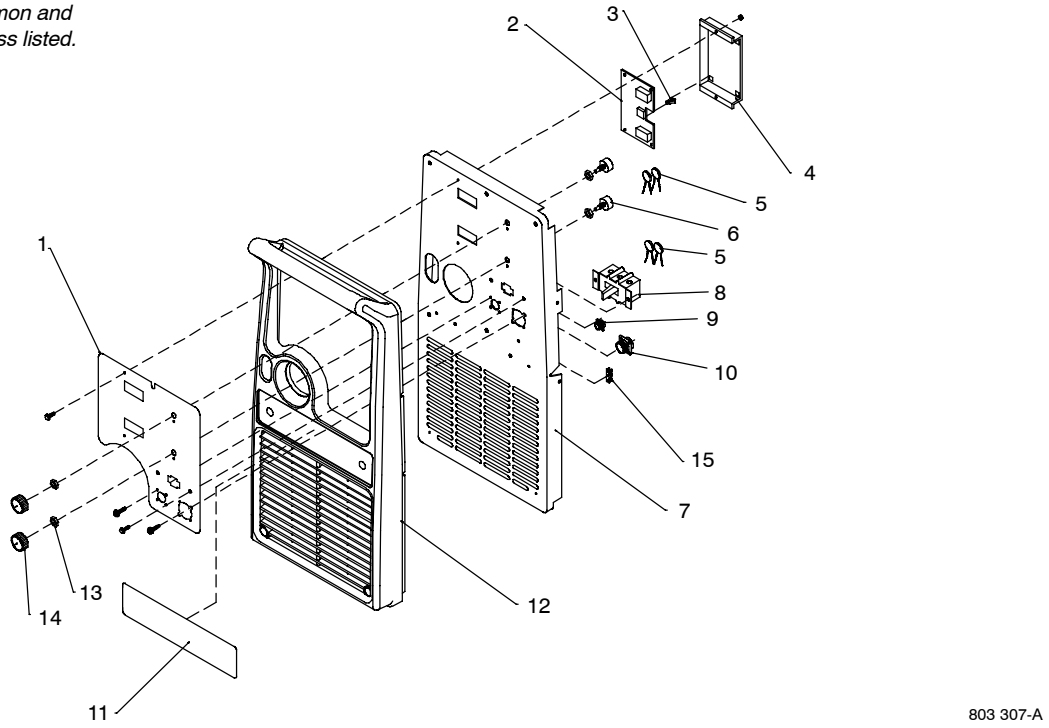


Figure 9-4. Panel, Front w/Components

To maintain the factory original performance of your equipment, use only Manufacturer's Suggested Replacement Parts. Model and serial number required when ordering parts from your local distributor.

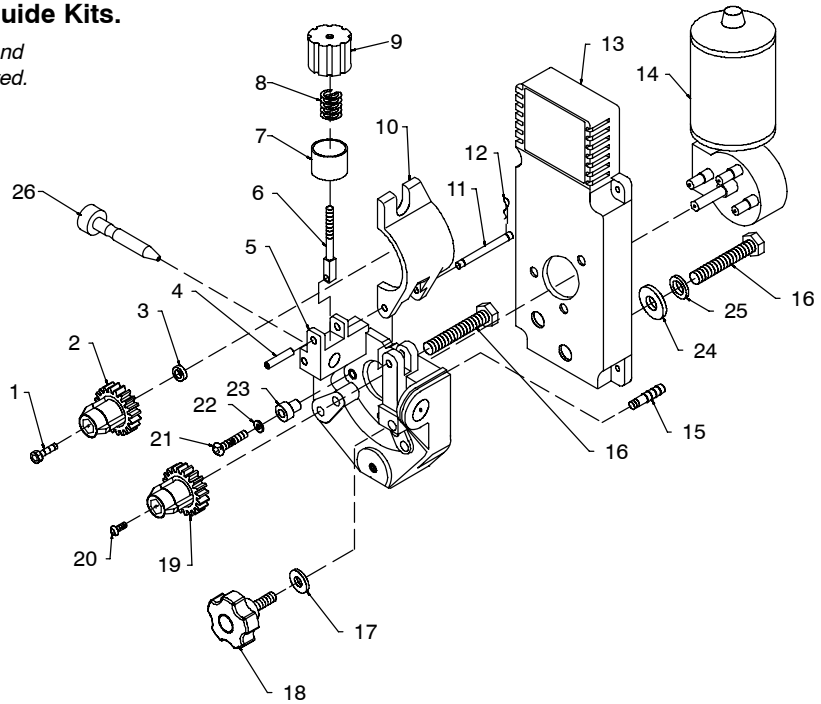
Item No.	Dia. Mkgs.	Part No.	Description	Quantity

Figure 9-5. Wire Drive And Gears (Fig 9-2 Item 26)

1		602 009	SCREW, .250-20 x 1.25 soc hd gr 8	1
2		172 075	CARRIER, drive roll w/components	1
3		166 072	SPACER, gear	1
4		010 224	PIN, spring CS .187 x 1.000	1
5		182 788	HOUSING, adapter gun/feeder	1
6		085 242	FASTENER, pinned	1
7		196 896	CUP, spring	1
8		196 897	SPRING, cprsn .695 OD x .095 wire	1
9		196 895	KNOB, tension adj	1
10		166 071	LEVER, mtg pressure gear	1
11		204 510	PIN, hinge	1
12		151 828	PIN, cotter hair .054 x .750	1
13		173 616	COVER, right angle motor	1
14	M	173 435	MOTOR, gear 24VDC (consisting of)	1
		193 633	KEY, woodruff .118 x .380	1
		193 634	WASHER, wave .405 ID x .740 OD	2
		193 635	RING, rtng ext .394 shaft x	1
15		079 633	FITTING, hose brs barbed M 3/16tbg	1
16		601 966	SCREW, .375–16 x 1.25hexhd	2
17		604 538	WASHER, flat stl SAE .312	1
18		204 585	KNOB, fluted	1
19		173 619	CARRIER, drive roll w/components	1
20		174 609	SCREW, M 4–.7 x 12	1
21		174 610	SCREW, M 6–1.0 x 20 soc hd	3
22		192 029	WASHER, flat .250 ID x .437 OD	3
23		173 620	BUSHING, motor mtg	3
24		602 243	WASHER, flat .438 ID X 1.00 OD	1
25		602 213	WASHER, lock .380 ID X .683 OD	1
26		*221 912	GUIDE,WIRE INLET	1
		203526	ROLL,DRIVE V GROOVE .030/.035 COMB WIRE	2

see Section 9-7
Drive Roll & Wire Guide Kits.

☞ *Hardware is common and not available unless listed.*



802 986-C

Figure 9-5. Wire Drive And Gears

*Recommended Spare Parts.

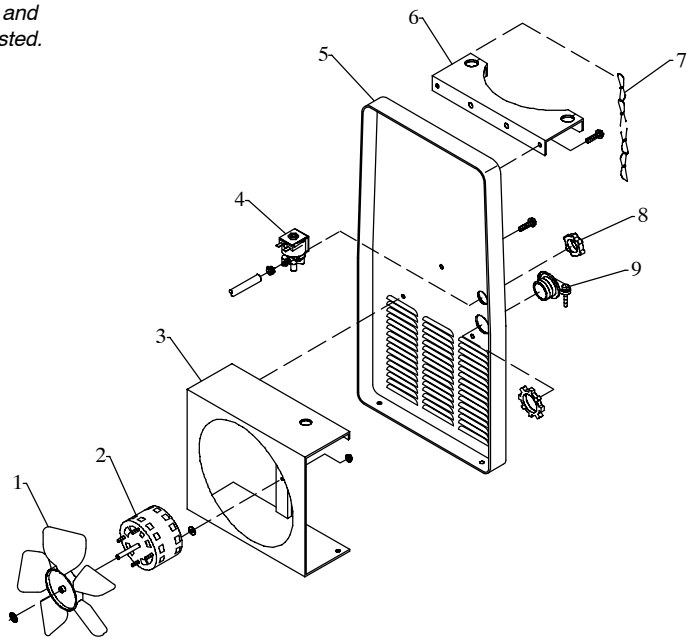
To maintain the factory original performance of your equipment, use only Manufacturer's Suggested Replacement Parts. Model and serial number required when ordering parts from your local distributor.

Item No.	Dia. Mkgs.	Part No.	Description	Quantity

Figure 9-6. Panel, Rear w/Components (Fig 9-1 Item 3)

1		148 809	BLADE, fan 9 in 5wg 34deg .309 bore CCW	1
2	FM1	188 706	MOTOR, fan 230V 50/60 Hz 1550RPM .312dia shaft	1
3		203 711	WINDTUNNEL	1
4	GS1	216 395	VALVE, 34VDC 2 way custom port 1/8 orf	1
5		203 478	PANEL, rear	1
6		169 654	+BRACKET, support tank	1
		200 285	LABEL, warning cylinder may	1
7		188 441	CHAIN, weldless 2/0 x 31.000 lg	1
8		137 761	NUT, 750NPT 1.31hex .27H nyl blk	1
9		604 102	CONNECTOR, clamp cable .690/1.070	1

☞ *Hardware is common and not available unless listed.*



Ref. 803 011

Figure 9-6. Panel, Rear w/Components

+When ordering a component originally displaying a precautionary label, the label should also be ordered.

To maintain the factory original performance of your equipment, use only Manufacturer's Suggested Replacement Parts. Model and serial number required when ordering parts from your local distributor.

9-7. Drive Roll And Wire Guide Kits

Note ☞ Base selection of drive rolls upon the following recommended usages:

1 V-Grooved rolls for hard wire.

2 U-Grooved rolls for soft and soft shelled cored wires.

3 U-Cogged rolls for extremely soft shelled wires (usually hard surfacing types).

4 V-Knurled rolls for hard shelled cored wires.

5 Drive roll types may be mixed to suit particular requirements (example: V-Knurled roll in combination with U-Grooved).

Wire Diameter			Kit No.	Drive Roll		Inlet Wire Guide
Fraction	Decimal	Metric		Part No.	Type	
.023/.025 in.	.023/.025 in.	0.6 mm	087 131	087 130	V-Grooved	056 192
.030/.035 in.	.030/.035 in.	0.8/0.9 mm	204 579	203 526	V-Grooved	056 192
.030 in.	.030 in.	0.8 mm	079 594	053 695	V-Grooved	056 192
.035 in.	.035 in.	0.9 mm	079 595	053 700	V-Grooved	056 192
.045 in.	.045 in.	1.2 mm	079 596	053 697	V-Grooved	056 193

Ref. S-0026-B/7-91

Notes

Notes

Notes

Warranty Questions?

Call
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Your distributor also gives you ...

Service
You always get the fast, reliable response you need. Most replacement parts can be in your hands in 24 hours.

Support
Need fast answers to the tough welding questions? Contact your distributor. The expertise of the distributor and Miller is there to help you, every step of the way.

Miller

TRUE BLUE® WARRANTY

Effective January 1, 2005
(Equipment with a serial number preface of "LF" or newer)

This limited warranty supersedes all previous Miller warranties and is exclusive with no other guarantees or warranties expressed or implied.

LIMITED WARRANTY – Subject to the terms and conditions below, Miller Electric Mfg. Co., Appleton, Wisconsin, warrants to its original retail purchaser that new Miller equipment sold after the effective date of this limited warranty is free of defects in material and workmanship at the time it is shipped by Miller. THIS WARRANTY IS EXPRESSLY IN LIEU OF ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, INCLUDING THE WARRANTIES OF MERCHANTABILITY AND FITNESS.

Within the warranty periods listed below, Miller will repair or replace any warranted parts or components that fail due to such defects in material or workmanship. Miller must be notified in writing within thirty (30) days of such defect or failure, at which time Miller will provide instructions on the warranty claim procedures to be followed.

Miller shall honor warranty claims on warranted equipment listed below in the event of such a failure within the warranty time periods. All warranty time periods start on the date that the equipment was delivered to the original retail purchaser, or one year after the equipment is sent to a North American distributor or eighteen months after the equipment is sent to an International distributor.

1. 5 Years Parts — 3 Years Labor
   * Original main power rectifiers
   * Inverters (input and output rectifiers only)
2. 3 Years — Parts and Labor
   * Transformer/Rectifier Power Sources
   * Plasma Arc Cutting Power Sources
   * Semi-Automatic and Automatic Wire Feeders
   * Inverter Power Sources (Unless Otherwise Stated)
   * Water Coolant Systems (Integrated)
   * Intellitig
   * Maxstar 150
   * Engine Driven Welding Generators **(NOTE: Engines are warranted separately by the engine manufacturer.)**
3. 1 Year — Parts and Labor Unless Specified
   * DS-2 Wire Feeder
   * Motor Driven Guns (w/exception of Spoolmate Spoolguns)
   * Process Controllers
   * Positioners and Controllers
   * Automatic Motion Devices
   * RFCS Foot Controls
   * Induction Heating Power Sources and Coolers
   * Water Coolant Systems (Non-Integrated)
   * Flowgauge and Flowmeter Regulators (No Labor)
   * HF Units
   * Grids
   * Maxstar 85, 140
   * Spot Welders
   * Load Banks
   * Arc Stud Power Sources & Arc Stud Guns
   * Racks
   * Running Gear/Trailers
   * Plasma Cutting Torches (except APT & SAF Models)
   * Field Options
     (NOTE: Field options are covered under True Blue® for the remaining warranty period of the product they are installed in, or for a minimum of one year — whichever is greater.)
4. 6 Months — Batteries
5. 90 Days — Parts
   * MIG Guns/TIG Torches
   * Induction Heating Coils and Blankets
   * APT & SAF Model Plasma Cutting Torches
   * Remote Controls
   * Accessory Kits
   * Replacement Parts (No labor)
   * Spoolmate Spoolguns
   * Canvas Covers

Miller's True Blue® Limited Warranty shall not apply to:

1. **Consumable components; such as contact tips, cutting nozzles, contactors, brushes, slip rings, relays or parts that fail due to normal wear. (Exception: brushes, slip rings, and relays are covered on Bobcat, Trailblazer, and Legend models.)**
2. Items furnished by Miller, but manufactured by others, such as engines or trade accessories. These items are covered by the manufacturer's warranty, if any.
3. Equipment that has been modified by any party other than Miller, or equipment that has been improperly installed, improperly operated or misused based upon industry standards, or equipment which has not had reasonable and necessary maintenance, or equipment which has been used for operation outside of the specifications for the equipment.

MILLER PRODUCTS ARE INTENDED FOR PURCHASE AND USE BY COMMERCIAL/INDUSTRIAL USERS AND PERSONS TRAINED AND EXPERIENCED IN THE USE AND MAINTENANCE OF WELDING EQUIPMENT.

In the event of a warranty claim covered by this warranty, the exclusive remedies shall be, at Miller's option: (1) repair; or (2) replacement; or, where authorized in writing by Miller in appropriate cases, (3) the reasonable cost of repair or replacement at an authorized Miller service station; or (4) payment of or credit for the purchase price (less reasonable depreciation based upon actual use) upon return of the goods at customer's risk and expense. Miller's option of repair or replacement will be F.O.B., Factory at Appleton, Wisconsin, or F.O.B. at a Miller authorized service facility as determined by Miller. Therefore no compensation or reimbursement for transportation costs of any kind will be allowed.

TO THE EXTENT PERMITTED BY LAW, THE REMEDIES PROVIDED HEREIN ARE THE SOLE AND EXCLUSIVE REMEDIES. IN NO EVENT SHALL MILLER BE LIABLE FOR DIRECT, INDIRECT, SPECIAL, INCIDENTAL OR CONSEQUENTIAL DAMAGES (INCLUDING LOSS OF PROFIT), WHETHER BASED ON CONTRACT, TORT OR ANY OTHER LEGAL THEORY.

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Owner's Record

Please complete and retain with your personal records.

Model Name	Serial/Style Number
Purchase Date	(Date which equipment was delivered to original customer.)
Distributor	
Address	
City	
State	Zip

For Service

Contact a DISTRIBUTOR or SERVICE AGENCY near you.

Always provide Model Name and Serial/Style Number.

Contact your Distributor for:	Welding Supplies and Consumables Options and Accessories Personal Safety Equipment Service and Repair Replacement Parts Training (Schools, Videos, Books) Technical Manuals (Servicing Information and Parts) Circuit Diagrams Welding Process Handbooks To locate a Distributor or Service Agency visit www.millerwelds.com or call 1-800-4-A-Miller
Contact the Delivering Carrier to:	File a claim for loss or damage during shipment. For assistance in filing or settling claims, contact your distributor and/or equipment manufacturer's Transportation Department.

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